# GEOGRAPHICAL REGIONS OF FRANCE

Sous les auspices du Comite pour l'Expansion du Livre Scientifique, Secretane General, Paul Gaultier, de l'lnstitute.

# GEOGRAPHICAL REGIONS OF FRANCE

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## FOREWORD

IT is a great pleasure for me to see my little book on the Geographical Regions of France translated into good English some ten years after its first French edition.

May I hope that it will enable more English readers to understand the real France and in some way help to bring British and French people closer together^

EM. DE MARTONNE,

*November,* 1932.

## PUBLISHERS' NOTE

Of the illustrations in this English version numbers 5, 6 and 18 were very kindly redrawn by the author. Numbers n, 17, 19, 20, 21, 22, 23 have no counterparts in the French editions.

The Explanatory Index is also a new addition, which will be found, it is hoped, of particular service to the English reader.

# PREFACE

THIS book is the outcome of a course of lectures delivered first in America at Columbia University, New York, and afterwards in Paris as part of a series of courses on the Civilisation of France, whiqh was instituted for the benefit of foreign students at the Sorbonne. It represents an attempt to render the many different aspects and resources of the country intelligible to any educated and inquiring mind by directing attention to the physical facts which usually underlie those differences and urging on every possible occasion the importance of first-hand investigation.

Though every region of France is not discussed, it is hoped that no distinctive or essential feature has been left unnoticed. If the reader will kindly and patiently follow our progress step by step, it is our object to familiarise him in turn with all the more important principles of physical geography. Thus, as his interest in the landscape increases, he may more readily appreciate the educational value of travel intelligently undertaken. Few countries lend themselves to this kind of demonstration as readily as France, and in the interest of those who visit her shores in ever-increasing numbers, the attempt is well worth making.

EM. DE MARTONNE.

*January,* 1921.

# CHAPTER 1

## PARIS

FROM the towers of Notre-Dame, St. Louis could survey his good city of Paris in all its details. Is there any point of vantage from which we can see all twentieth-century Paris at a glance and master its topography? From Montmartre we are conscious only of a sea of houses, whose waves, beating on the hill, seem to gather from the farthest horizon. From the upper platform of the Eiffel Tower the view extends to the open country, where the serried ranks of dwellings thin gradually out; as far as Versailles one may still trace the streets, and factory chimneys do not cease to smoke till Villeneuve is reached and Saint Denis. But we cannot distinguish details. We might learn more from an aeroplane, if we flew several times over the massed buildings that burst the confines of the fortifications and spread in all directions, but to complete our survey we should still require to drive or walk through all the different districts, for to know Paris is to know a whole geographical region.

**Topography of Paris.**—Its essential feature is the valley of the Seine. From the towers of Notre-Dame or the roof of the Louvre we see the river sweeping its harmonious curve, imprisoned between the high stone quays and intersected by an almost infinite multiplicity of bridges. The sides of the valley begin to rise at some distance from the river, as if to leave room for the

development of the city. The inclines leading to the high-lying districts of the Butte Sainte Genevieve and Montrouge, like those of Belleville or Montmartre, meant the use of extra horses only a few years back, though now they fail to check the speed of the motor omnibuses or the electric trams.

Even if you knew nothing of the history of the place, you might guess that the capital of France came into existence in the space left free between these heights and the banks of the river, for that is where all the important buildings congregate. They follow the course of the Seine and form a collection that has no rival in the whole world: Not re-Dame, the Saint e-Chapelle, the Palais de Justice, the Church of Saint Germain of Auxerre, the Louvre, the Madeleine, the Invalides, etc.

The concentric circles formed by the boulevards will not escape the airman's notice or that of the observer with the plan of the city on his knees. Here, surely, is a chapter of history written indelibly upon the ground. Along the inner circle on the north side of the river, from the Madeleine to the Bastille past the Opera, the life and movement are intense. But the main course of traffic seems to move from north to south, or from east to west, following lines which intersect at right angles. The Rue de Rivoli, running parallel to the Rue Saint Honore, is one of these lines projected in the magnificent perspective of the Champs-Elysees. The Boulevard Saint Michel and the Boulevard de Strasbourg, running parallel to the two old streets, the Rue Saint Jacques and the Rue Saint Denis, represent the second.

Each of these two main axes plays its individual part. Along the axis running east and west at a tangent to the bend of the Seine there are more open spaces and great

buildings, more evidence of refinement, especially towards the west, where the Champs Elys£es sees a stream of private vehicles flowing every afternoon towards the Bois de Boulogne. Along the axis running north and south commercial activity attains an extraordinary intensity. Delivery-vans of every kind throng the Rue Montmartre and the Rue Saint Denis; trade-signs are displayed on every floor. Towards six o'clock in the evening things grow quieter) and even the Boulevard de Strasbourg is comparatively empty despite the lights in the ground-floor shops, which are kept on to a very late hour. Commercial life seems to reach its greatest intensity round the point of intersection of the two great arteries. There the great stores (the Louvre, the Samaritaine, the Pygmalion, etc.) he close together; the central markets maintain the scene of animation all night long, and the vegetable carts overflow into the Boulevard de Strasbourg.

These two main axes of traffic must surely have something to do with the history of Pans and the physical geography that underlies it.

**District specialisation.**—As we carried our study of Paris further, we should find all the features of the great modern capitals represented. Each quarter has its special function corresponding to its antiquity and the conditions of its development: commercial districts lying at the centre, where the two axes intersect, or round the railway stations (Gare Saint Lazare, Gare de l'Est and Gare du Nord); districts occupied by government departments or by great historic buildings lying near the historical centre along the Seine; residential quarters lying for the most part north of the river,

where streets or avenues built in the nineteenth century have opened up new thoroughfares; popular quarters, where small shops and tap-rooms illuminate the swarming streets till all hours of the night, and the houses shelter twenty or thirty times as many people as elsewhere; industrial districts relegated to the outer fringe beside the ramparts, or beyond them in the suburbs. Besides these there are all the varieties of suburban life. Here the houses are not so tall and, on the whole, less closely set, though they congregate into nuclei that form regular towns in themselves more or less welded together. Some of these, like Versailles or Saint Cloud, are still residential, others almost purely industrial, like Suresnes and especially Saint Denis.

The disposition of all these different districts is explained by the history of the growth of Paris. The basic features are those which we noticed at the outset: the part played by the Seine; the antiquity of everything which lies on the northward curve described by the river; the circular form of the boundaries of the community as indicated by the line of the fortifications now demolished; the concentric circles of the boulevards suggestive themselves of ancient fortifications; and lastly, the two main axes of traffic running respectively north and south, and east and west, with their point of intersection exactly coincident with the centre of greatest activity. These are essentially geographical features, and the history of Paris has given them permanence on the lines laid down by its physical geography (see Fig. 2).

**The nucleus.**—Paris came into existence in the Gallo-Roman period on the **lie** de Ia Cite and the slopes

of the Butte Sainte Genevieve, at the point where it is easiest to cross the Seine. It was possible to throw two bridges of moderate dimensions across the two arms of the river. There were numerous other islands both upstream and down, and the position of several branches of the river which have now disappeared has been determined (Fig. i). Opposite the mouth of the Bievre were

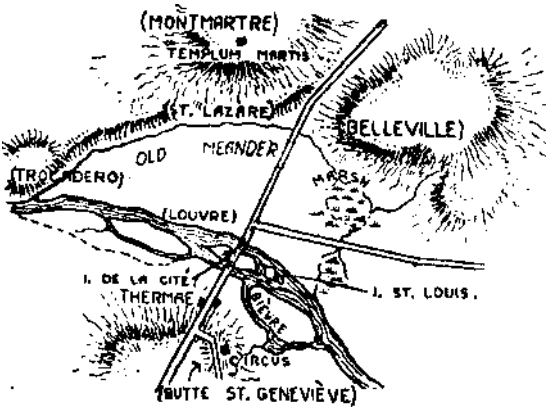


**FIG. I**
**THE SITE OF PARIS**

marshes indicating the off-take of an abandoned meander and these were drained by a brook, which flowed at the foot of the high ground about Belleville and Montmartre and entered the Seine nearly opposite the Champ de Mars at the foot of the Butte du Trocadero. All along this ancient river-bed, borings reveal sandy alluvial deposits which become soaked by seepage at times of heavy floods. In 1910 the water in these deposits overflowed into the cellars near the Gare Saint Lazare and

caused subsidences in the streets. Along this line one of the ancient town walls has been traced.

The He de Ia Cite, therefore, offered the easiest passage across a plain intersected .by the courses of streams and marshes. The great north road here crossed the road from east to west which came down the Marne valley and followed the Seine. The advantage of the situation was apparent as soon as Paris definitely became the capital of the Capetian "Kings of France." *"La croisee de Paris''* is a term we find in use in the Middle Ages, and it referred to the two main axes of present-day traffic. These "cross-roads" attracted trade, and soon the town spread from the south bank and the island to the north bank. At the beginning of the thirteenth century, Philip Augustus protected it by a first Ime of fortifications, including all that was most important in the old town as far as the Luxembourg on the south, the courtyard of the Louvre on the west and the island of Saint Louis on the east.

Within that area wide open spaces still remained, but only for a time: the mass of buildings soon overflowed the ramparts and spread over the north side of the river along the two axes of the "cross-roads/'

**Modern Paris.**—Louis XIII enclosed seventeenth-century Paris, which numbered already a quarter of a million inhabitants, in a new line of fortifications. These extended as far as the old meander, which made **the** construction of a wet moat a simple matter. The Marsh *(Marais)* lying opposite the mouth of the Bievre was gradually to be turned into market gardens brought under cultivation to supply the needs of what was by this time a town of considerable size. Hence the name *Marai-*

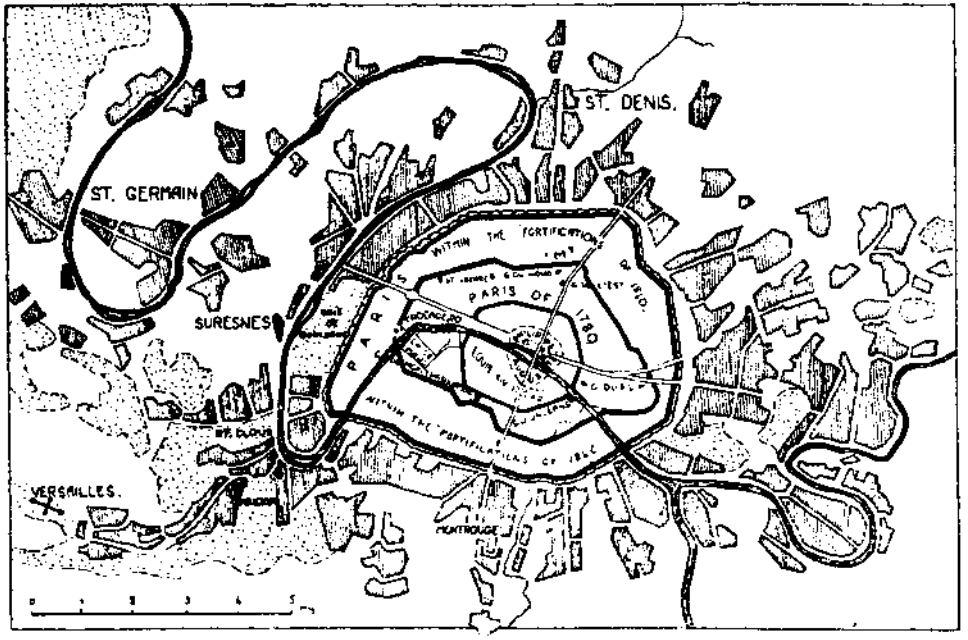


FIG. 2

**GROWTH OF PARIS.**—MT = Montmartre. The solid lines show the course of the modern boulevards

*chers* (market-gardeners) and *cultures maraicheres,* which we still apply to all the market gardens in the suburbs. In the eighteenth century a district called *le quarher du Marais* rose on the site of these gardens as the houses gradually encroached upon them.

The fortifications of Louis XIII included practically all the ancient buildings of Paris, which, as we have seen, bordered the Seine. By the end of the seventeenth century the ring was already too narrow. The population of Louis XIV's capital had doubled. A new line of defences was accordingly erected in the eighteenth century known by the name of the ''Wall of the Farmers General.'' Carried outwards from the same centre for another 1,000 or 1,500 yards to the foot of the Butte Montmartre (Fig. 2), it doubled the diameter of Louis XIIFs defences. When the old walls were demolished, they became the line of the inner boulevards, on which the nineteenth century was to see the Opera and most of the theatres built. The Porte Saint Denis and the Porte Saint Martin indicate the spots at which two ancient parallel streets, following the axis that runs north and south, emerged from the ramparts, as the Bastille marked the old eastern exit of the other main traffic route.

In 1789 the "Wall of the Farmers General" still enclosed great open spaces—Abbeys with vast gardens, which have now become public buildings and promenades. This was the line of the defences of Paris in 1814. The population only began to increase rapidly after the second Restoration, and with the development of railways its growth became more and more rapid. In 1831 the population of Paris was 785,000; in 1841, 935,ooo. The million was passed in 1851, and the two millions in 1881. In 1921 it reached 2,900,000.

**Contemporary Paris.**—As early as 1840 it was decided to build a new line of fortifications in view of a probable development to which no bounds could be assigned. That line remained standing till 1914. The "Wall of the Farmers General" has given us the belt of the outer boulevards. When Montmartre was taken into the lines of 1840, it was still rural. The railway stations were placed near the line of Louis XIII's fortifications, which forms the inner boulevards, for there the necessary space was still available. These are the Gare Saint Lazare, the Gare de 1'Est, the Gare du Nord, the Gare du Paris—Lyon—Mediterranec (the P.L M.), and the Gare Montparnasse. To-day they are stifled for lack of space to enlarge their approaches.

Far-sighted as were the views of the future entertained in 1840, Paris has outgrown them, for development has proceeded at a constantly increasing pace. Most of the great modern arteries were the work of the Second Empire and often followed the old main axes of traffic, but sufficient care was not taken to preserve the gardens inherited from the old palaces and abbeys. The extension of the town beyond the fortifications was not foreseen, and the development of the suburbs was left entirely to chance.

We see the factories moving constantly outwards towards the circumference in obedience to natural laws, and as they move, they displace the market gardens or the country cottages of the Parisians and call into existence districts of workmen's dwellings and small shopkeepers.

We see the country cottages, and even the permanent suburban residences spreading further afield with the growth of transport facilities; for extra train services or

trams now give daily access to the centre of Paris. **The** market-gardens are also being pushed further **and** further out.

**The future.**—Now that the **work of removing the** nineteenth-century fortifications has been completed, increasing interest is also being shown in the problems of town-planning as they relate to the outward extension of the serried buildings of Paris. This growth is as much dependent upon certain natural controls as was the life of the original town itself. If the lie of the land is to be used to the best advantage, the operation of these natural controls must be better understood, and to that end we must look further afield than we have done hitherto, and view Paris in the broad geographical setting of the Paris Region

# CHAPTER II

## THE PARIS REGION AND THE PARIS BASIN

FAST trains soon carry us beyond the limits of the suburbs of Paris, and in half an hour we find ourselves in the real country. Whichever direction we take, we meet with nothing but the gentlest type of relief: from coigns of vantage of nature's own providing we contemplate a series of endless, calm horizons. The capital of France was born in a country of hills and tablelands and smiling valleys.

**Landscapes of the Paris Region.**—Two aspects of the soil recur on every side, serving alternately or in combination to produce harmonious landscapes: great expanses of flat or gently rolling surfaces form dry tablelands covered with crops, where the eye must look far to find the belfry of a village. Between these tablelands lie depressions of undulating ground, bounded by wooded slopes, rich in springs and running water, and crowded with dwellings surrounded by orchards and gardens.

Popular names still in common use define with sufficient accuracy the limits of these tablelands: to the south-west lies *Beauce,* stretching to the Loire; to the east and south-east is *Brie,* which reaches to the confines of Champagne; to the north is *Valois.*

Physical geography offers an explanation of the two aspects of the country round Paris which takes us back to the period when man had not yet set his impress on *it.*

The tablelands consist of calcareous strata sometimes covered with a more or less sandy loam; the depressions are the work of erosion removing the softer strata, the sands and clays, the marls and the gypsum. The strata that underlie the Paris Region were laid down in horizontal beds at the bottom of the seas and lagoons of the Tertiary era, but slight undulations of the crust have altered their shape. The erosion of the valleys has proceeded in accordance with the degree of resistance offered by the materials out of which they have been carved.

The great table of Beauce, which lies some 500 or 600 feet above sea-level, seems to represent the original surface of which the isolated hills of Montmorency and lTIautie, north of Paris, are relics. At Meudon it directly dominates the Seine; and the Fontainebleau sands are everywhere visible on the steep wooded slopes, crowned by the limestone cornice. It forms the tablelands dissected by the smiling valleys of Chevreuse and Port Royal, which are trenched in the same sands. These valleys open on to the platform of Brie, which is notched by the Seine from Corbeil to Villeneuve Saint Georges At Saint Cloud and Saint Germain the edge descends towards the Seine in a series of pitches, the most pronounced of which corresponds to the flat exposure of coarse limestone prolonged on the north of the river by the Valois platform.

**Geology of the Paris Region.—If** you make the slight effort required to remember the regular succession of the strata underlying the Paris region (Fig. 3)—plastic clay and sands at the base, over them coarse limestone, then sands, marls, Brie gypsum and limestone, and finally

green clays, Fontainebleau sands and Beauce limestone, the shortest excursion in the neighbourhood of Paris will afford you an object-lesson in geography. You have the key to nearly all the variations in relief. Here a little valley cuts deep into the edge of a limestone tableland, and there another widens because it is crossing the clays or marls; one hill is steep because it has retained its capping of hard rock, while the profile of another is smoothly rounded. You cannot see the spring that feeds the village fountain and laundry pool, but you know it is there, since such springs invariably appear on the scarp when the clay crops out below the sands.

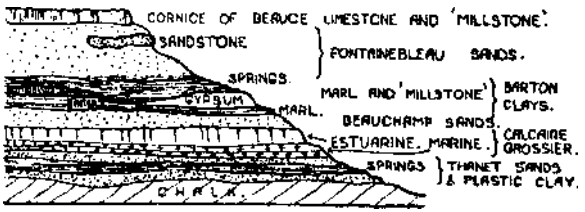


FIG. 3
STRATA OF PARIS REGION

Before long, your eye will light with interest on the quarries which make white patches all along the high ground, evidence of ways in which the local geological structure may assist the development of a great town. The gypsum has furnished plaster in abundance. The coarse limestone has given the finely dressed stones of our cathedrals and public monuments. The Beauce limestone has been transformed by water action into a flinty, cavernous rock, very hard and very light, called millstone, an ideal building stone, which is still taken from pits all along the edge of the tablelands. When you

further discover that the Brie limestone is itself always in the millstone state, embedded in the clay which represents the residue of the dissolved limestone, you will understand why the Brie platform has not the appearance of a porous limestone tableland, like the platform of Valois, why pools are frequent there and the soil often moist, as is generally the case also on the edges of Beauce. When you have paid a visit to the quarries about Orsay and Chevreuse which yield the sandstone lying in rounded concretions among the looser sands, you will know where the sets come from that pave the streets of little towns like Etampes. These are the sets that were for centuries the pride of the Paris streets, and the backbone of the highways which brought the waggons and stage-coaches to town. Even the chaos of fantastic blocks that tower in the gorges of Apremont and Franchard, above the rich mantle of the royal forest of Fontainebleau, will then appear as part of the natural order of things.

**Settlement of the Paris Region.**—Last, but not least, you will be able to appreciate the deeper meaning of the striking contrast between the bare tablelands and the verdant hollows. If we study the vegetable mould, which reveals the conditions of the primeval vegetation, and the existing flora of the region, if we investigate the history of its settlement and compare it with that of neighbouring regions, we find ample evidence that this contrast dates from the earliest times. The climate of the Paris Region makes it one of natural forest; but the dry, or at least ill-drained, tablelands, covered with sandy loams and swept by the winds, must have been sufficiently free of timber to attract man to them in Neolithic times.

There is no doubt that they were inhabited before the damp depressions, where the forest descended without a break to the bottoms of the marshy valleys. The old district names belong to the tablelands. It was over them the ancient highways passed, it was the meeting of the three tablelands of Beauce, Brie and Valois that helped to fix the point where the Seine was crossed, and so to decide the location of Paris.

The clearing of the forest-clad slopes and the draining of the marshy bottoms have gradually opened up new roads to settlement, as they have in all central and western Europe. The advantages of the zones of transition from one tableland to another have become more and more obvious. The springs on the hillsides, where the clays and sands meet, have commonly determined the sites of the villages strung out along the sides of the valleys and hills round Paris. The warmth of the limestone or gypsum soils on slopes with a good exposure has promoted the cultivation of fruit and even of the vine, for which the district enjoyed a reputation in Roman times. The damp bottoms have proved, when drained, kindly to market gardens as well as to hay crops. The villages on the slopes and in the valleys are the result of a process of expansion that continued throughout the Middle Ages.

Two types of rural economy and settlement, radically different one from the other, and characteristic respectively of the tablelands and the intervening depressions, have gradually established themselves. On the uplands we find large-scale agriculture, big estates **with** villages pretty widely spaced or large farms. The whole district is covered with cereals, fodder crops or sometimes beetroot. Here and there in Brie, and

sometimes in Beauce, a clump of trees remains, especially on the edge of the tableland, but actual forest is rarely found The population is comparatively scanty; conditions are often rather backward, minds are not alert. To the monotony of the horizons on the high ground, the varied character of the depressions stands in sharp contrast. There is variety alike in the landscape, the resources and the kinds of occupation. While every type of farming is practised, the commonest form is the small holding, a type unknown on the tablelands. Orchards and market gardens surround the villages: there are woods everywhere, crowning the escarpments or following the damp valley-bottoms where these have not been converted into fields or natural meadows. The multiplicity of villages and the density of the population stand in direct relation to the partition of landed property.

Obviously the co-existence of two types of region so radically different must have favoured the growth of a great town. In the days before organised transport brought wheat and meat and vegetables from the four corners of France to fill the maw of Paris, the city found all she needed in her immediate neighbourhood. Even to-day, the wheat of Beauce and Valois, the milk and cattle of Brie, contribute their quota to the feeding of Paris. Every day the market gardens extend further and further along the Seine, the Marne and the Juine. Before the war of 1914-18 they covered nearly half a million acres in the outer suburbs, producing fruit to the value of over £800,000 and nearly a million pounds' worth of vegetables.

The more we widen our horizon, the more we gain in the understanding of Paris. Let us lift our eyes yet further.

If the germ of the city, the primitive cell, was anchored to its present site by the crossing of the Seine, and the "cross-roads" at the bridge-head gave direction to its growth, had we not better follow the routes that meet at that nodal point? Had the geographical conditions been less favourable, would the node ever have been formed at all?

**The Basin of the Seine and the Paris Basin.**—The most elementary atlas shows that in the north France is made up of plains and hills, while mountains occupy a large area in the south. The Seine drains the greater part of the northern plains; the network of its tributaries spreads out fanwise with Paris more or less in the position of the pin of the fan. One is tempted to call the basin of the Seine the Paris Basin, but the latter name deserves acceptation in a wider sense. If you ascend the valleys that converge on Paris, you pass by scarcely perceptible cols beyond the limits of the basin of the Seine. The Loire and the Allier, the Meuse and the Moselle-seem at first to be descending towards Paris, like the Marne, the Oise and the Yonne. The Paris Basin extends as far as the ancient mountains called, on the north, the Ardennes, on the east the Vosges, on the south the Central Massif, and on the west the Armorican Massif.

Starting from the centre of the Basin, communication is easily effected in every direction. We have not merely the highroads, supplemented in modern times by the railways; there are canals to transfer barges from the basin of the Seine to those of the Loire and the Saone, the Meuse, the Rhine and the rivers of Flanders. Lighters coming down the Oise unload on the quays of Paris the

great blocks of coarse limestone from the quarries of Creil; from more distant sources they bring the coal of the north, or even of Belgium, to the Paris coal-yards. Reckoned by the tonnage of merchandise she handles, Pans is the foremost port of France. Even in the Middle Ages the guild of watermen of the Seine was one of the most powerful in the city.

The future promises to be more brilliant still. During the war of 1914 -18 there was an enormous traffic on the Seine from Rouen to Paris in cereals, iron and coal to supplement the output of the northern mines. The advantages that would result if the fairway were deepened to allow ocean-going vessels to reach the capital are now universally admitted.

The ease with which communication is effected by water is as much the consequence of the steady flow of the rivers as of the absence of elevated watersheds. The only tributary of the Seine that attains the speed of a torrent is the Yonne as it comes down from the Morvan. The winter rains, running off the bare, moist, chilly soil, raise the level of the grey-green waters of the Seine to the arches of the bridges; evaporation lowers the summer level to the bases of the piers, but never uncovers a mud bank. Floods like those which submerged the quays in 1910 are accidents which scarcely happen more than once in a hundred years.

The steady character of the flow is doubtless due to the mature stage which the valleys have reached and to the regular profile of the *thalwegs,* but it must also be attributed to the harmonious combination of pervious and impervious soils. While the latter shed the rain water off their surface, the former absorb a great deal of it and restore it drop by drop in the form of springs.

The same alternation of calcareous and sandy strata with beds of clay and marl, which causes in the Paris Region the alternation of bare tableland and verdant depression, is repeated throughout the basin of the Seine and extends to the limits of the Paris Basin.

**Sub-soils and types of geographical regions.**—This great region of hills and plains, modelled by thousands of centuries of geological history, revealed its nature to the earliest scientists who interested themselves in the characteristics of the soil. Guettard, in the eighteenth century, recognised a succession of limestone, sand and clay belts arranged in circles round Paris. It is more than a hundred years since Elie de Beaumont* established their age and their relation to the relief as well as to the streams, routes of communication and even the life of the inhabitants Since his day ideals on the subject have gained in clarity, and more and more weight is given to the part played by erosion in determining the area of exposures and consequently the topography.

It is .now definitely established that the Paris Basin is a depressed region in the geological as well as in the topographical sense, and is formed of Secondary and Tertiary strata lying between massifs of Primary or Archaean rock—the Ardennes, the Vosges, the Central and the Armorican Massifs. In the centre of it there are beds of the latest Tertiaries, thrown into the gentlest of waves and dissected into tablelands and broad vales. This is the Paris Region. Round the circumference lie Secondary strata. In the west the chalk covers vast areas and forms the tablelands of Picardy and Normandy.

***Dufrenoy and Elie de Beaumont, *"Explication de Ia carte giologtque de Ia France,* Vol. II (Paris, 1848).**

But the east has an entirely different arrangement: it was on this side that Elie de Beaumont noted the concentric ridges with eastward-facing scarps, corresponding to the rims of the successive calcareous tablelands, which are separated by moist depressions of clay soil and rise steadily eastwards (Fig. 4).

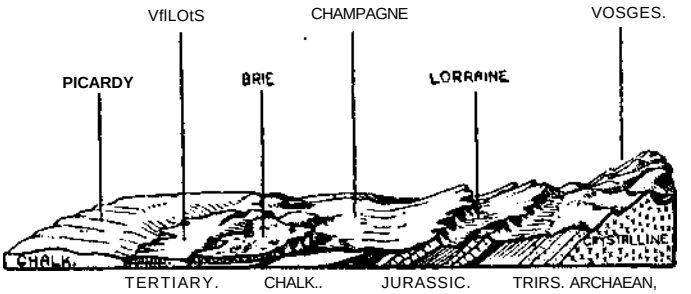


**FIG. 4**
**REGIONS AND ROCKS OF THE PARIS BASIN**

These three types of subsoil structure, which have their counterparts in three different types of scenery, do not destroy the unity of the Paris Basin. Within a radius of 150 to 250 miles round Paris, travel in what direction you will you find the same wide horizons, the same ease of communication, the same plains or bare tablelands, which carried the population in the distant past, alternating with moist depressions, colonised at a later date, but now the centres of the densest settlement.

Our survey of the Paris neighbourhood has made us acquainted with the centrally situated Paris Region, the very nucleus of France, as the City was the nucleus of

Paris. We are now to be introduced to the type represented by the chalk plains that cover so wide an area in Picardy and Champagne. Thereafter the study of Lorraine will enable us to understand regions of a still more varied type. There erosion has moulded the gently rising strata in an eminently characteristic fashion. We find a series of concentric belts; limestone ridges, with their wooded scarps facing to the east, alternating with broad and fertile vales whose ends he open to the north and south.

# CHAPTER III

## PICARDY AND CHAMPAGNE

ONE hour in an express train will carry you beyond the Pans Region. About Persan and Beaumont on the Northern line, or Epernay on the Eastern, the change in the landscape is equally striking. Hitherto, on either route, you have been crossing bare, level uplands with rapid alternations of verdant depressions; the horizon is continually bounded by the next height or woodland. At Epernay the valley of the Marne broadens suddenly and seems to lose itself in a boundless plain. Ascend the vine-clad hills, and the view extends eastwards to the most monotonous and dreary of horizons. You are looking over the plain of Champagne. The effect is the same when the steep sides of the valley of the Oise, gashed by quarries near Creil, suddenly disappear. From the wooded hills that overlook Pont Sainte Maxence your eye meets a treeless stretch of country, mounting in broad and gentle swells to the horizon. You will find the same monotonous landscape as far as Arras and beyond. That is Picardy.

The vast plains of Picardy and Champagne consist of the same soil. Over enormous areas it is formed from beds of chalk, a soft calcareous rock, more or less marly m character and penetrated by countless delicate fissures, which render it permeable. Ease of access attracted men to these plains at an early date, and there has been much movement over them. Armies in every age have

here stood face to face to dispute the mastery of the routes that lead to the heart of France. The battles of the Somme and of Amiens recall more than one clash in earlier history. The fate of Gaul, when Attila threatened it, was decided on the plains of Champagne; Dumouriez checked the Prussians at Valmy in the same region, just as Joffre in 1914 called a halt to the German advance at the Marne.

But similar scenery and common memories do not mean the absence of marked differences, as is shown by the separate political and economic destinies of the two ancient provinces of Picardy and Champagne. The former is richer in the possession of more varied resources despite its more monotonous landscapes. The latter is poorer, and would descend to the category of steppe-land, were it not for the borderland that surrounds it, where all its wealth is to be found.

## PICARDY

**The landscape.**—Picardy is not a real plain. The land rises gently to nearly 600 feet. The roads run straight up the inclines, and the cyclist thinks the climb will never end; but the railways have to make detours to avoid the little waterless valleys, and they cross the brows of the rounded hills in cuttings. Dryness and the absence of trees are the most striking characteristics of this land of clear-cut, monotonous horizons. One does not notice the villages, for they lie low in folds of the ground, where the deep wells reach water more easily. The church tower is often all that is visible, rising above the trees that embosom and conceal the cluster of houses.

Fields one sees on every side, fields with their endless furrows or strips of varying hue. According to the time of year, the light green or gold of the wheat alternates with the crude green of the beetroot, the red carpet of the flowering clover or the pale yellow of the colza. In autumn the sheep appear on the stubble among the straw-ricks, but the cattle that fill the great byres of the villages are rarely to be seen.

The richness of the soil is evident, yet the passenger who crosses the country by rail sees it to his astonishment apparently deserted. The chimney of a sugar-refinery cutting the honzon, or the imposing buildings of a great farm standing by itself on the tableland, seem to be the most visible traces of man's presence.

The chalk subsoil, to which we attribute the characteristics of the landscape, is really seldom visible. Even the railway cuttings generally display the same fine yellow loam that the plough makes light work of in the fields, or else a kind of stiff clay full of flint pebbles. The chalk of Picardy must have been exposed to the weather for more than one geological period; the thorough decomposition of the limestone has left a residuum of clay-with-flints. The loam, like the loess of Alsace, has been deposited grain by grain by winds laden with fine dust. But for these superficial deposits, the scenery of Picardy would be more monotonous still. The most fertile fields are to be found in those districts where the lanes are sunk between walls of loam six feet or more in height, and never a tree is to be seen. These are the districts, too, where the tablelands are driest and dreariest. If woods appear, and the surface is hollowed into little valleys in which springs ooze and brooks run, you may be sure that the clay-with-fhnts forms a thick, impermeable

crust, a niggardly soil that the plough refuses to attack.

Nevertheless, the open, dry expanses are the commonest type of scenery, and that is why the main valleys, such as that of the Somme, which cut deep enough into the tableland to bring the ground water to the surface in a thousand springs, impress the observer so strongly. Viewed from above, the valley seems to be one great forest. The tall poplars hide everything from sight. The ribbon of the river, winding in lazy meanders, is concealed by the willows; thick clumps of reeds wave their feathery heads above the pools of black water that occupy the whole width of the flat bottom-land. At rare intervals there are dry expanses, where the foot meets a sparse covering of grass growing on the peaty soil. There are no dwellings in these marshy bottoms, but at the foot of the steep valley-walls, where the springs break out, the villages are numerous. Towns have grown up at the easiest crossing-places, using the marshes for purposes of defence. Such is Peronne, which guarded in days gone by the Ime of the Somme and checked the Imperialists in the time of Richelieu.

Amiens, a commercial and industrial town, has found another use for its belt of swamps. Reed-beds, alders and wet meadowland have given place to market gardens, carefully dug and manured, on the rich vegetable mould. The artificial channels make a network of waterways, navigated by the flat boats of the *hortillons*, or market-gardeners. Every morning they unload at the wharves below the apse of the cathedral the city's daily supply of vegetables.

**Geographical limits.**—The scenery characteristic of Picardy extends well beyond the boundaries of the **old**

province of that name, and the geographer finds it difficult in some directions to say exactly where it stops. Such limits as can be indicated are very clearly marked by the relief as determined by the structure of the subsoil and the work of erosion.

An English officer stationed on the Somme front, who had on more than one occasion to travel by car from Amiens to Rouen, told me how much he was surprised at the change in the character of the landscape which had always struck him in the neighbourhood of Aumale: the valleys suddenly deepened; woodlands, streams and meadows took the place of naked uplands devoted to the plough. The same impression must occur to the traveller wherever he crosses a line drawn from Dieppe to Beauvais, no one with eyes to see could fail to notice it. The green land which here separates Picardy from the tablelands of Normandy bears a name which still lingers in the speech of the people. It is called Bray, and it stretches from north-west to south-east, its direction being plainly marked by the courses of the Bethune and the Therain. On its confines the tablelands of Picardy and Normandy attain a greater elevation than anywhere else, but they fall in well-marked scarps to a land of low-lying, wet ravines. Erosion has attacked the summit of a ridge of chalk lying on an axis parallel to the course of the Somme and the lower Seine. The removal of the chalk has left the beds of clay and sand belonging to the lower Cretaceous and the Jurassic series exposed, and these have been easily carved into a labyrinth of well-watered ravines.

Bray marks clearly the southern limit of Picardy, prolonged by the edges of the tablelands of the Paris Region towards Saint Maxence and Saint Gobain. An

equally clear limit is set on the north by Boulonnais, a depression similar to Bray and of the same origin, but not so elongated, since it represents a more definitely dome-shaped elevation.

Between Arras and Lille there is a striking fall in the ground, bringing its level three hundred feet lower. Here lie the famous positions of Vimy and Notre-Dame de Lorette, which command the mining district of Lens and were the object of such fierce engagements in the Great War. The exposure of ancient formations at the foot of this slope indicates that it also is associated with an uplift of the underlying strata. Here we have the limits of Picardy in the widest extension of the term.

North-eastwards Picardy ends on the Thierache, where the woodlands and meadows about Guise and Hirson, east of Saint Quentin, proclaim the near presence of the old Ardennes Massif.

**Development of the natural resources.**—Within these limits there developed a typical old-fashioned agricultural and industrial region. By a strict process of adaptation of man to the soil, Picardy had attained even in the days of Old France an astonishing degree of prosperity, and throughout the nineteenth century it kept its place in the van of progress of every kind. Even the savage and systematic devastation of the War failed to take the heart out of the people, who cling to the land where they were born and bred.

A brief visit to the country is not enough. To understand it properly, one should stay in every village and every little town, chat with the country folk, and take the trouble to examine the documents that show how the

economic system has evolved through repeated transformations.

No part of France has been longer in human occupation. At the time when Paris was just coming into existence in a clearing of the forest, the tablelands of Picardy had already been stripped of their trees and submitted to far-reaching cultivation. In the Middle Ages they were the granary of Flanders. In the sixteenth century the oleaginous plants, flax and hemp, were introduced to supplement the cereal crops. A vigorous, healthy agriculture flourished through all the countryside. As population increased, and the labour-market became over-stocked, people were not content to remain idle in the winter months. Industry in Picardy was of the rural type, as it was in many of the old French provinces. Linen cloth was woven; the wool of the sheep that wandered in great flocks over the fallows was carded and spun. Certain districts, like Vimeu, specialised in lock-making, others in hosiery. All the necessities of life were to be found in the markets, and they were produced within a radius of thirty or forty miles.

Something of this ancient manner of life survives. In certain village streets the looms are busy even now. The hammers of locksmiths may yet be heard in Vimeu. Cereals arc still the most widely-grown crop, but the nineteenth century has seen many changes due to the development of communications and the opening of markets to foreign competition. Until about 1880 it seemed likely that sugar-beet, sown in rotation with wheat and artificial feeding stuffs, would reign supreme on the upland loams, while flax and hemp were in process of extinction. But the last twenty years of the century saw German competition gaining ground in the sugar

industry and an increasing output of Russian wheat. Fodder crops are consequently more and more sown, and cattle more generally bred, while the flocks of sheep dimmish with the shrinkage of the fallows. Chicory is sometimes even displacing wheat, but where the latter crop is still grown, the yield is increased by the use of nitrates. The big farms on the uplands use the latest machinery and supplement the shortage of local labour by calling in gangs of Belgian workmen at harvest-time. Even the peasant proprietor is ready to adapt himself to any necessary changes.

By degrees industry has migrated into the towns, which for so many years were markets rather than centres of production. Saint Quentin was a woollen market in the twelfth century, but turned to linen goods in the sixteenth and finally, in the eighteenth, to cottons. Amiens, which remained faithful to woollens, had a large export trade to Brazil, the United States, Germany and Switzerland as late as 1840, but the increasing pressure of competition is turning its activities towards outfitting and foot-wear.

Wherever we look, then, we find the same adaptiveness, the same ingenuity, the same tenacity. The soil of Picardy has produced a type of population whose vitality the ravages of war have never succeeded in depressing. No previous devastation ever approached the ghastliness of this last one. The fields were literally riddled with shells, orchards and spinneys were mown to the ground, villages left with not a wall standing: yet the guns were hardly silent before families were on their way to look for the site of their homes amid the ruins, and almost before the barbed wire had been rolled up, or the shells dug out, the plough had turned the

furrow, and patches of ripe corn were streaking the ravaged steppes with gold.

Vigour and health have come again to the land of Picardy and its life goes on as before.

## CHAMPAGNE

**Dry Champagne.**—The word *Champagne* or *Campagne* denotes in France those dry limestone regions, bare of trees, where men could move with freedom even in remote ages. There is a *Campagne* of Caen; Le Mans and Berry have each their own *Champagne,* but the region traversed by the Marne above Epernay has the best right to the name.

Nothing could well be drier or more naked than these plains. The aridity of the soil has passed into a proverb and discourages all attempts at cultivation. For hundreds of years there was nothing to be seen on the *savarts* of Champagne except a few stunted elms and bushes of dogwood or blackthorn. The land was left fallow for year after year; the sheep that grazed on the sweet but scanty grass provided the most reliable source of income. The size of a piece of land was measured "by the shout/' the distance that a lusty voice could carry. Even to-day the traveller crossing the country has the sensation of being in a kind of desert, for the villages are hidden in the folds of the ground, where the wells can more easily reach water. He gets no such impression of agricultural wealth as he does in Picardy.

The dryness of Champagne is due to the absence of loam and clay-with-fhnts. The white chalk is never far from the surface and is exposed in the shallowest excavation. During the War it gave the trench systems the

appearance of white ribbons, and shell holes looked like splashes of paint. The chalk soil forms a sticky paste when it rains, but dries out rapidly and hardens as it dries. The earliest immigrants found themselves in a regular steppe-land, and collectors still find botanical specimens that recall the flora of South Russia.

The progress of agriculture has done little for the *savarts;* the peasant will tell you that the land "simply eats manure/' Nevertheless, there is a noteworthy increase in the area under fodder crops. Long belts of pine-woods recently planted on the drier ridges break the monotony of the landscape. Two great military camps some forty square miles in area lend an appearance of animation to the more arid stretches, near Chalons and Mailly, but the density of the population remains comparable with that of mountain regions, about thirty-eight to the square mile.

**Wet Champagne.**—How could so poor a country ever become the nucleus of a political *unit?* The question can only be answered when we approach the borders of the province. The plain of Champagne is not the whole of Champagne. A few broad, well-watered valleys cross it, those of the Aisne, the Marne and the Aube, and there the bulk of the population is concentrated. Follow these valleys upstream for twelve miles or so, and you will see them gradually widening, while the level of the dry plain rises, and little valleys become more frequent. Tributaries appear, branching into a network of little streams. The eye rests on green woods and fields of grass. A new type of country is taking shape along a belt stretching from Troyes to Vitry-le-Francois and Bar le Due. This "Wet Champagne" is the fertile part;

its inhabitants despise those of the dry country, which they call "Beggarly Champagne." The change is due to the eastward upfold of the strata of the Paris Basin, which has enabled the forces of erosion to remove the white chalk, thus exposing the clays and sands of the lower Cretaceous series. Valleys with gentle slopes and flat bottoms often covered with layers of alluvium determine the general character of the region; nor does that character change until the point is reached where a more pronounced upfold has elevated the Jurassic limestones of the Bar district.

This country was originally covered with forests and swamps. The clearing process was begun in the Middle Ages by the great abbeys. The fertility of the soil rapidly attracted settlers, and meadowlands spread over the valley bottoms, arable fields up the slopes, and orchards on the hillsides with a favourable exposure. The abundance of water admitted of a wide distribution of farms and hamlets, a fact which still in part accounts for the striking difference in the local scenery from that of the calcareous plains. Potter's clay and the iron ore readily extracted from the sands supplied the raw materials of industries fostered by the inexhaustible reserves of fuel to be obtained from the forests. Towns grew up in the larger valleys There are six of them, of which three bear the name of Bar (Bar-sur-Seine, Bar-sur-Aube and Bar-le-Duc). Saint Dizier, once a fortified town and a centre of the metal industry, still manufactures nails and wire. Vitry-le-Francois retains its character of a market-town. But Troyes is the really big town, and it is there that the essential unity of the two Champagnes manifests itself. Thither the *savarts* of Dry Champagne used to send the wool of their sheep to

sustain a celebrated cloth trade, and the fairs of Troyes attracted merchants from the distant Rhine. At the piesent time hosiery is becoming the staple industry.

**Argonne.**—Following the Cretaceous belt of sands and clays, which gives Wet Champagne its peculiar character, in a northward direction, we witness a surprising change in the landscape. North of the Ornain the zone of wet valleys contracts, and about Thiaucourt the north-eastern horizon is bounded by a continuous ridge clothed in thick forest. It is the Argonne Massif rising like a barrier between the basins of the Aisne and the Marne, dividing Champagne and Lorraine and forming one of the most important lines of defence of the Paris Basin. After the Battle of the Marne the stabilised front clung to these heights, and their green valleys were drenched in the blood of endless struggles.

Here we have no limestone bastion like the other ridges of the Paris Basin; the ramifications of the ravines that dissect it indicate an impermeable soil. The clays of *Vallage* and *Perthois* are replaced by a sort of clayey sandstone called *gaize,* a block on which erosion has made little impression. The unbroken expanse of forest was hardly touched by the clearings of the Middle Ages. Viewed from any elevation it seems to cover the whole country. It supplied the fuel for the old glass industry and the forges that have now disappeared. It still constitutes the wealth of the rare villages to be met with in the narrow clearings, with their strips of beautiful meadowland and orchards running along the main valleys. The inhabitants cling to the habit of seasonal migration. The woodcutters set out in November and scatter through all Wet Champagne and Lorraine to

return in June for the hay-harvest. In September they leave home again to gather the grapes in the vineyards of Reims and Epernay.

**The wine district** appropriately completes the picture of old Champagne, for the whole of which it is a focus of attraction. It is also the special endowment of the region best known to the world at large.

It corresponds to a strongly marked physical feature. Its endless rows of carefully tended vine-stocks clothe the eastward slopes on the edge of the Tertiary tablelands of the Paris Basin. The eye, weary of the interminable plain of Champagne, is drawn to these ridges from afar. The rim of the tableland, dissected by erosion, forms a scarp alternately advancing and retreating, with promontories and relict hills, like the *Montagne de Reims*, narrow outlets, like that of the Marne at Epernay, or wide funnels through which a river once flowed, like the marshes of Saint Gond. The invariably flat summits are crowned with woods growing on the Brie millstone. The villages cling to the slopes on the spring-line half-way up, where the Tertiary sands and clays meet. The surface drainage has spread these deposits over the lower chalk slopes and endowed them with an excellent natural soil very different from the poverty-stricken *savarts*. On it the plough has been at work for centuries past. Vines and fruit trees have surrounded the villages since the Middle Ages, and the population has always been large and well-to-do; but the extension of the vineyards till they now invade every hillside is of comparatively recent date. It is due to the invention of the process by which the wine is transformed with the addition of sugar into a sparkling

beverage. The new product became immediately popular.

It was in the eighteenth century that the Abbey of Hautvillers began the making of "champagne/' To-day the vines in the districts of Reims and Epernay, though they cover nearly fifty square miles of country, are far from sufficient to produce and maintain the stock of 2,200,000 gallons of the bottled wine. But no device is neglected to obtain the biggest possible yield. Every plant, carefully pruned and treated with sulphate, grows in a sort of artificial soil composed of different kinds of earth and manures and carried up to the vineyard in baskets. When the time comes to gather the grapes, gangs of labourers arrive from all the country round. The process of champagne-making benefits from the facilities offered by the chalk subsoil; miles of cellars have been excavated without difficulty, where the wine is kept at a constant temperature that allows it to ferment slowly. A great number of specially trained men are busy down in these depths. The value of the production justifies every sacrifice. By 1900 the yearly deliveries amounted to 28,000,000 bottles, nearly three-quarters of which were shipped abroad.

It would, however, be a mistake to suppose that the wine district of Champagne produces nothing but the wine of that name. That industry is of recent growth and cannot explain the rise of towns like Reims and Epernay. Even to-day it does not represent the most important field of activity.

Reims is one of the oldest of the towns of Gaul. In conjunction with Epernay she guards the roads to the east and the north which cross at the foot of the ridge. As the religious metropolis of the country, Reims long retained the privilege of seeing the Kings of France

consecrated in her marvellous basilica, lately subjected to so much German savagery. As a market-town lying at the junction of two different regions, Reims, like Troyes, made a bid for the wool of Dry Champagne and early became one of the principal *villes drapantes*, or cloth towns. Thanks to her accumulated capital, she has remained an important centre of the cloth trade, finding work in her mills for 14,000 hands. Like the other devastated towns, she will rise from her ashes and resume her place in the economic life of Champagne, of which she and Troyes are the two most active centres.

We can now understand how the natural regions which constituted Champagne came to be grouped together. The poor *savarts* of the central plain find their complement in the regions that lie on their borders. Wet Champagne attracts the population and develops both agriculture and urban life. Argonne is an inexhaustible reserve of wood and a rampart for defence. The ridge of the wine district is covered with flourishing villages and towns that also depend for their industries upon the wool of the *savarts*. In this way a geographical unit was built up, as typical an example of the economy of an old French province as we may well expect to find.

# CHAPTER IV

## LORRAINE

TILL the eighteenth century historical Lorraine was an independent state consisting of territories not easy to disentangle from those of the three Bishoprics of Metz, Toul and Verdun, and lying in the upper basins of the Meuse and the Moselle. From the geographical standpoint we may define Lorraine as the country on the east of Champagne extending to the Vosges and the Ardennes, and bounded on the south by the high ground which limits the plain of the Saone.

Within these frontiers the variety of the scenery is calculated to surprise anyone coming from the plains of Picardy or Champagne. One day's walking brings you from a dry upland to a belt of broad, well-watered valleys, and through a thick forest out into open country beyond. At every step you meet old local names still used for little natural regions clearly differentiated by a special type of soil or a particular mode of life—*Haye, Voevre, Saalnois, Xaintois,* and the like. The landscape, which is always varied, has sometimes pronounced features suggestive of the near approach of mountains. Metz and Nancy nestle at the foot of heights that reach an altitude of 1,300 feet above sea level and nearly half as much above the surrounding country, affording from their summits a prospect of vast horizons. Verdun and Saint Mihiel lie hidden in the valley of the Meuse, which here flows between hills no less imposing.

**The Ridges of Lorraine.**—We must look more closely at these heights if we want to understand the complex structure of Lorraine. They form lines of unsymmetrical relief remarkably persistent and clear-cut. They turn a steep scarp eastwards, scalloped by the forces of erosion and carved into spurs and relict hills, while the reverse consists of a tableland sinking gently to the west. The name for such a scarp-ridge is *CSte,* a word which belongs to the local speech. All along the Cotes de Meuse you may trace the villages bearing such suffixes as *sous Ia Cote, dans les Cotes,* or simply *Ia Cote.* It is the same along the Cotes de Moselle.

The summit of the scarp-ridge falls rapidly away and is everywhere crowned with forests spreading to **a** greater or less extent over the nearer parts of the westward slope. Here and there it is gashed by quarries revealing the limestone that forms a resistant cap to the high ground. Lower down, where the slope grows gentler, the furrows of the arable land disclose a heavy soil. The villages are strung out halfway down, their houses closely grouped about the church-towers, at the point where the outcrop of the clay brings out the springs Still lower down the slope, meadows descend to the foot of the ridge, and then, in most cases, comes a valley, large or small.

On the other side the ground rises in gentle undulations, till the dark outlines of forests on the far horizon indicate the back of another ridge.

Physical and economic geography here confront us with a combination of singularly characteristic features. The Ridges are the most striking element in the structure of Lorraine. The varied resources they had to offer attracted men to them in the far distant past. Here they

found wood and water, land suitable for ploughing and for orchards and meadows, vast open horizons to the east, and defensive positions that the art of fortification turned to good account when, at a later date, the Cotes de Meuse and the approaches to Metz were provided with a bristling array of forts.

A few easily observed details show clearly where we must look for the explanation of these features of the relief. The limestone cornices on the brows of the Ridges, the depressions trenched in the clays will be familiar features to anyone who is acquainted with the scenery of the Paris Region. What is new is the unsymmetrical relief. This is due to the uplift of the strata into the form of a basin with its rim resting on the old massifs of the Vosges and the Ardennes. The relief, which corresponds so closely to the geological structure, is the result of centuries of erosion. First came the delving of the primitive, or "consequent," valleys following the dip of the strata. Then the tributary, or "subsequent/' valleys developed, till the contact of the resistant limestone and the more plastic beds of clay was laid bare.

You may find evidence of the ancient drainage system that came down from the Vosges on the higher ground untouched by later erosion, in the shape of gravels or blocks of sandstone scattered over the Cotes de Meuse or in the forest of Haye, near Nancy. But you will note with some surprise that the principal rivers no longer take this original direction. The Meuse and the Moselle carry off all the water of Lorraine northwards. If you follow the front of the Ridges, you will notice breaches which appear to mark the line of consequent valleys, but it is by no means the rule that these gaps should always be occupied by important rivers. The Moselle at Pont

Saint Vincent enters a gap of this nature, but at Toul it avoids the corresponding gap that would carry it straight into the Meuse. Nevertheless, it is quite evident from the fact that the alluvium derived from the Vosges spreads as far as Verdun, and from the meanders so clearly worked in the dry valley called the *Val de VAsne,* that the river at one time took this course (Fig. 5).

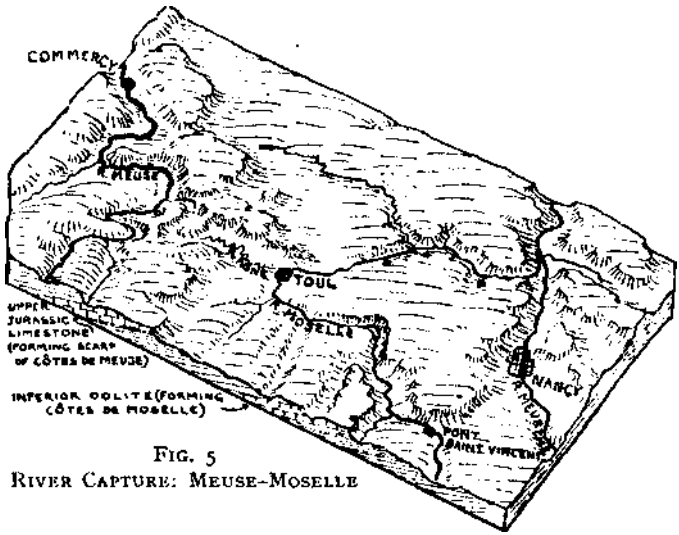


FIG. 5
RIVER CAPTURE: MEUSE–MOSELLE

Whatever may have been the causes that brought about these modifications in the drainage, the result of these episodes in a long process of evolution is very clear: the Ridges have been, comparatively speaking, degraded, and erosion has made the sites suitable for human occupation much more numerous. Every gap contains its town. Verdun and Saint Mihiel guard ancient river-passages through the Cotes de Meuse, as Toul commands

the Val de l'Asne, which is utilised by the road, the railway and the Rhine-Marne canal. Nancy is placed at a nodal point, whose position is fixed by the notch of the Meurthe and the gaps of side-valleys isolating the hills of St. Genevieve and Maxeville from the Ridge.

When the tilting of the strata is sufficiently pronounced, the cornices on the Ridges cannot be more than six or seven miles apart; but where the dip is less marked, the Ridges are more widely separated, and the forces of erosion are excavating at their foot vast belts of clay with a stiff but fertile soil, such as the Voevre.

The most remarkable Ridges, those of the Meuse and the Moselle, are formed of the thick beds of the Jurassic limestone. A resistant layer many feet thick may find expression in a line of relief, like the hills of shelly limestone of Triassic age east of Nancy.

The further east one goes, the higher the Ridges and the depressions which separate them rise above sea-level. The blue line of the Vosges showing on the horizon lies beyond forest-clad uplands which are themselves the back of a final Ridge formed of Triassic sandstones.

**The life of earlier days.**—Here, then, we have the setting that geological vicissitudes and the processes of denudation have furnished to the country of Lorraine.

The earliest arrivals found a hilly region probably covered entirely by woodland. The climate of Lorraine is strikingly damper and more severe than that of the Paris Region and the plains of Champagne. The west winds, laden with cloud, are held up by the Ridges of Lorraine and deposit on them twice the amount of rain that falls in the neighbourhood of Paris. The Heights of the Meuse are covered with snow several times in the

course of the winter, and from Nancy the outskirts of Haye show white for weeks together. Frosts begin in the Voevre with the end of November and often damage the fruit of the orchards round Metz in the spring.

The severity and early onset of the cold season do not, however, prevent the summers being warm enough to ripen fruit, including the grape, on slopes with a sunny exposure. The climate, in fact, is of the continental type. The vicinity of the mountains and the general elevation account for the autumns being particularly wet In the valley bottoms, and especially along the Meuse, fogs sometimes lie about for a whole week at a time.

Everywhere in this country tree-growth flourishes. It is certain that the forests of the Ardennes and of the Vosges were once continuous. But in some places the loamy soil suggests that there may have been regions clear of trees, through which early man found gradual entry. In the Gallo-Roman period we find traces of a series of settlements whose inhabitants made good use of all the varied resources of the land—woods full of game, running water abounding in fish, springs, fertile soils and sunny slopes. In the Middle Ages the clearings became more general, and the regional types, each with its characteristic life, took form at an early date.

The forest still holds sway on all the higher ground. In the neighbourhood of Epinal, near the Vosges, it covers the sandstone tablelands without a break, and it caps the edge of the limestone Ridges. When these Ridges lie near enough together it bridges the intervening gap, as in the case of Haye. Usually the clearings have bitten into the backs of the Ridges, but the dweller in the valleys scorns the villages of woodcutters and sabot-makers who till a few stony fields on the uplands. "At Uruffe,"

according to a local saying, "the Devil is clemmed."

The stiff soils on the lower ground are most sought after for agriculture. Woods still cover part of *Vocvre,* and there are ponds at the head of nearly every valley. After the winter rains the clay soil forms a sticky paste that makes hard going for the plough, but fine crops of wheat repay the efforts of the husbandman.

In *Saulnois* we find the same scenery broken by the same ponds and woods. This is old arable country, dotted for centuries past with prosperous little villages. The value of land increases if it lies under a limestone Ridge with villages or perhaps small towns along the face of it. The belt of Liassic soils along the Cotes de Moselle is especially noteworthy for the heavy, rich earth turned up there by the plough.

Town life has not failed to develop amid the rural surroundings of Lorraine. Naturally the towns grew up where the routes from east to west were compelled to make use of the gaps in the Ridges, or cross the marshy valleys at definite points. Thus Neufchateau, Commercy, Saint Mihiel and Verdun mark the line of the Meuse, as Luneville, Nancy, Toul and Metz mark those of the Meurthe and the Moselle. The number of different centres corresponds to the natural divisions of the country. Little ecclesiastical or civil lordships and free towns as well persisted here for hundreds of years.

In this manner there developed a life of separate communities intense enough to root a hard-working population firmly to the soil. It finds expression to this day in two types of human settlement: the Lorraine village with its low, squat houses strung out on each side of a broad street, each with its orchard at the back, and in front the wagons and the manure heap in close

proximity—dwellings modest in appearance, but the homes of small proprietors who maintain their families in easy circumstances; and the old city of Lorraine, sleepy, but rich in memories of great events and in institutions that express the spirit of an enlightened middle class.

You may still find this kind of life in the open country of Voevre, in the valley of the Meuse and beneath its Ridges, or in little towns like Neufch&teau, Commercy or Mirecourt. But a new spirit passed over the greater part of the region in the nineteenth century.

**Industrial and modern life.**—From the view-points presented by the forest solitudes of the Cotes de Meuse we see the smoke of the blast furnaces of Briey rising beyond the placid horizons of Voevre; round Nancy the slagheaps rise in regular cones: the Moselle gap at Pont Saint Vincent proclaims its presence from afar by the smoke of its factories and the white patches of the minette quarries in the forest above them. Whereas the countryside, still purely agricultural, is losing its population, and the old towns are to some extent shrivelling, entire districts are congested and feverish with industry, and towns are springing up or expanding beyond anything that their past history could lead us to expect.

Lorraine possesses everything she needs to become an industrial region: she has wood, salt, iron and coal.

Salt, which is found in the beds of the Upper Trias, is one of the natural resources that first drew men to these parts and determined the commercial routes. It gives its name to *Saulnois* and the ancient town of *Chateau Salim. It* feeds the chemical industries of the neighbourhood of Nancy. The department of Meurthe and Moselle used to produce two-thirds of France's salt supply.

Iron forms a series of very persistent and very rich beds at the upper limit of the Lias. As a result of the erosion which shaped the Cotes de Moselle, these beds crop out on the flanks of hills and ravines from Thionville to Nancy. The woods that crown the ridge made it possible to set up a large number of foundries at quite an early date, but the greatest exploitation of the ore began with the substitution of coke for charcoal.

Coal is close at hand and comes very near the surface in the Sarre Valley. Under the First Empire the French Government brought this basin to the fore, though its German princes had neglected it, and pushed forward the extraction with great vigour. Later on, borings were to reveal the presence of coal within the borders of Lorraine itself, and in 1913 four mines were producing between them nearly four million tons.

Twice over within half a century the desire to possess this wealth has brought German armies on to French soil. In 1871 Bismarck fixed the frontier well beyond the limit of German speech, which had been made the pretext for the annexation, just on the line which his experts told him would include the whole ferriferous basin. Flourishing establishments in the neighbourhood of Thionville, which the activity of our iron-masters had created, fell into the hands of Germany, and she was able by degrees to raise the output to more than 20,000,000 tons, nearly a third of all the ore treated in her blast furnaces.

But part of the population of the annexed territories flowed back to France. Nancy, which till 1870 was still a quiet old city, woke to the call of industry. A search was instituted for iron ore along the whole face of the Ridge. Even on the French side of the frontier im-

posed upon us by the conqueror, west of the Cotes de Moselle, our geologists saw reason to believe that in conformity with the general structure of the Paris Basin, the ferriferous beds of the Lias extended downwards under the Jurassic strata of Voevre. In 1882 a series of borings was begun which established the presence of a rich ferriferous basin under the tableland of Briey on the back of the Cotes de Moselle west of Metz and Thionville (Fig. 6). Extraction began in 1890

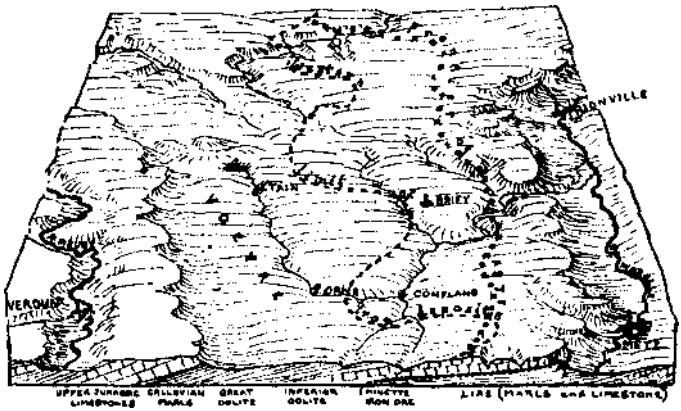


FIG. 6
IRON IN LORRAINE

Of the two boundaries crossing the figure from N. to S. the left shows the western limit of iron deposits; the right, the Franco-German frontier of 1871.

and steadily increased. A regular revolution passed over that quiet countryside.

Up till then agricultural Lorraine had lived its old life: little villages depending for their livelihood on their wheat and wood and common pastures; a population of some 120 to the square mile with a marked tendency

to diminish. In a few years, actually between 1891 and 1906, the population was trebled; the villages of Jeuf, Homecourt and Auboue, which had had only a few hundred inhabitants, now possess 25,000. The industrial cities are building longer and longer rows of small houses; business offices in wooden huts are springing up. Workmen are flocking in, largely from foreign countries, Belgium, Germany, and particularly from Italy. Piedmontese oaths resound in the streets at nighty and noisy squabbles break out on the doorsteps of the wine-shops. This invasion scares the country folk at first, but they soon realise that the industrial centres pay good prices for all the soil can produce. In 1912 the output of ore in French Lorraine reached 17,000,000 tons, which is more than three-quarters of the total produced in the whole of France.

One of the objects with which Germany went to war in 1914 was to lay hands afresh on this hard-won wealth. Happily the event has turned out otherwise. With the return to France of the annexed portion of Lorraine, the local supply of ore for French metallurgy amounts to nearly 40,000,000 tons, a more than ample quantity when we consider our coal supply.

The future of Lorraine lies in commerce and industry. Little towns and agricultural districts will not abandon their placid existence, but the sap is flowing towards the metallurgical centres and the modern towns. Not that the physical features of the country have changed; industry may add a touch or two to the general picture, but the calm horizons of Voevre, the bold, harmonious lines of the Cotes de Meuse with their crown of forests and their zone of smiling villages will always remain the essential features of the landscape of Lorraine.

# CHAPTER V

## THE VOSGES AND ALSACE

FROM the heights that dominate Nancy the view extends beyond the open country of Lorraine to rounded summits whose blue outlines float above wooded hills. They are the Vosges. Behind them the eye of the French patriot, after 1871, could picture the fair and fertile plain of Alsace, rudely torn from France by a defeat which the victory of 1918 has at last wiped out. The Vosges and Alsace are inseparable. The unity of the mountain massif may not prevent its two sides from having different political destinies; but one can think of Lorraine without the Vosges; one cannot think of Alsace without them. Even from the physical point of view, as we shall see, it is impossible to understand the mountains apart from the trench of the Rhine, with which its whole history is bound up.

## THE VOSGES

The prime signification of the name Vosges has always been a forest country extending beyond the actual mountains. Even to-day the name of *V6ge* is given in the speech of the people to the limestone tablelands south of Epinal, which extend with a gradual fall as far as Bains and Lure. For geographers the Vosges are a mountain massif 100 miles in length from north to

south and 25 miles broad at the most, with summits never rising above 4,500 feet. Its waters flow eastwards to the Rhine, westwards to the Moselle, and southwards to the Saone, and its watershed is roughly the dividing line between the French and German languages.

**The two sides of the range.**—Seen from the open country of Lorraine, the outline of the Vosges cuts a wavy line on the horizon: there are no outstanding peaks. The nearer you approach, the more completely you lose sight of it as it disappears behind a screen of wooded hills. Very different is the appearance of the range as you approach it from the Alsatian side. Seen from the banks of the Rhine, it appears even at that distance as a formidable, unbroken barrier. From Mulhouse or Colmar the peaks can be discerned; they show regular but very bold slopes separated by deep discontinuities.

If you cross the Vosges by way of the Schlucht, or the col of Sainte Marie or Bussang, after a comparatively gentle climb on the Lorraine side, you will suddenly be confronted by a striking view of the deep Alsatian valleys opening at your; feet. Take the celebrated walk by way of the crests of the *Wasen,* or "Lawns," through the flower-strewn pastures above the forest from the Ballon d'Alsace to Honeck, and you will have all the way, on your left, a series of gently undulating slopes and, on your right, steep scarps to which the forest can scarcely cling, falling to some little lake or swampy bottom.

The dissimilarity between the two sides of the Vosges is their most striking geographical feature and the one that contributes most to the charm of their scenery. Its explanation lies in the conditions of their structure, and

it is itself the cause of a whole series of contrasts which help to give the Vosges their individuality—contrasts of climate, vegetation and even of economic life.

If you look at a large-scale map, you will notice that on the west the crests rise gently to the highest peaks of the Vosges, while there is an almost immediate fall to the plain of Alsace. From Epinal a rise of 3,000 feet involves a journey of over thirty miles as the crow flies. The Ballon de Guebwiller towers some 4,000 feet above the little town from which it takes its name, yet its summit is not six miles distant from the spire of the church.

Look at the geological map, and you will see that the Vosges consist for the most part of Archaean rocks, granite and crystalline schists, and Primary formations.

**The Yosges and the Black Forest.**—To understand the significance of these facts we must look beyond the Rhine. From Strasbourg or Colmar we see a lifie of heights to the east just as imposing as the Vosges in the west. That is the Black Forest, built out of the same rocks and affording the same unsymmetneal profile, but this time with its steep side facing the Vosges and its gentler slopes turned towards Wurttemberg and the basin of the upper Neckar. The airman who crosses the plain of the Rhine from west to east sees it distinctly as a trench between two massifs symmetrically arranged. The geographer derives a similar impression from the inspection of a good map.

Geologists have long realized that these two massifs were formerly one. They are the remains of ancient mountains folded and uplifted in the Primary epoch and smoothed by the same process of erosion which has modelled the gently rolling summits of the Vosges. In a

more recent geological epoch the earth movements which gave birth to the Alps had their repercussions upon this block, thrusting it up in the form of a dome between the Paris and Swabian basins. But the old rocks, too rigid to stand the strain, broke asunder, and the summit of the dome fell in, forming the Rhine trench. Occasional accumulations of Secondary strata, much disturbed by faults, occur at the foot both of the Vosges and of the Black Forest to bear witness to the subsidence (Fig. 7).


FIG. 7
THE RHINE TRENCH

Erosion stimulated by the subsidence of the Rhenish plain attacked the Alsatian face of the Vosges with great vigour. The valleys are sunk deeper than on the Lorraine side, the rolling summits are dissected into crests, sometimes even into separate hills, steep-sided and rounded at the top, which go by the name of "balls" *(ballons).* The glaciers which covered the range during the Pleistocene period enlarged the heads of the eastern valleys into little corries, where little lakes reflect the scarps above them.

Such is the origin of the most pronounced contrast between the Lorraine and the Alsatian sides; but there are other contrasts as well.

**The granite Yosges and the Sandstone Yosges.**—As you traverse the range from south to north you will notice that the altitude progressively diminishes. At Saverne and Sarrebourg the Vosges seem to flatten out even more completely than at Lun£ville and Epinal. They tower over Belfort with as imposing a skyline as at Mulhouse or Colmar. You will see the same thing in the Black Forest, which stands up high at its south end and sinks to nothing at the north. This is another proof of the relationship between the two massifs. The whole block now broken in two down the middle must have been uplifted at its south end by the thrust of the Alps.

Nor is that all. On both sides of the trench the sinking towards the north results in the disappearance of the ancient massif below the mantle of Permian and Triassic sandstones. All the southern part of the Vosges is granite; all the northern, sandstone. Thus Donon is a relic of the sandstone covering rising boldly on its base of ancient rock. Further north all the summits are of sandstone. The rounded tops of the granite Vosges have vanished: in their place we find tabular platforms separated by valleys with scarped sides and flat bottoms. But the greatest change, the change that the traveller will perhaps find most striking, is in the vegetation. In the granite Vosges the forest is a garment everywhere in holes—on the tops, in the valleys, and frequently on the slopes; but all the sandstone summits wear a continuous covering: only the valley-bottoms there show strips of meadowland with here and there a village. For all their

lower elevation, the sandstone Vosges are less hospitable to man and carry a smaller population. But the same contrast between the Lorraine and the Alsatian sides is still observable. From the Col de Saales or the Col de Saverne the descent eastward is as rapid as that from the Schiucht.

This contrast is certainly the most characteristic fact about the Vosges. We find it repeated in the climate and the vegetation.

**Zones of Altitude.**—As always among mountains, we note as we ascend towards the summits a gradual lowering of temperature, the disappearance of cultivation, the extension and finally the disappearance of the forests. Human activity has appreciably altered the appearance of the natural vegetation zones Wide meadowlands cover the valley bottoms and sometimes, with the help of irrigation, extend up the slopes along with their screens of poplar, ash or alder, the arable fields often climb to 2,500 feet where the slopes have been cleared, and the forest of mixed beech and spruce reaches on an average 4,000 feet. In all probability it was attacked both above and below, though doubtless men's efforts on the upper side were confined to the enlargement of the grassy glades dotted with stunted bushes, which covered in the natural state the summits called *Hautes Chaumes,* whose rounded, wind-swept tops lie under snow for four or five months of the year.

The same zones occur on each side of the range, but not exactly at the same altitudes. The Lorraine side, directly exposed to the west winds, is much rainier than the Alsatian. Epinal gets over thirty-seven inches of rain against a bare nineteen at Colmar, Snow lies

longer in the valleys of Lorraine; the spring comes later, and the summer is cooler. Certain winds of local prevalence emphasize the contrast. A warm, dry breeze often issues from the valley of Munster when it is raining over in Lorraine. The walker finds surprises awaiting him when he crosses the cols. He may be drenched by the heavy downfall as he climbs from G£rardmer and see the sun shining on the plain of Alsace and the clouds dispersing as he follows the wide curves that bring him down again eastward of the crest.

It is not to be wondered at, then, if rye and barley are found at over 2,700 feet on the slopes of the valleys of Alsace, that cabbages are grown at nearly 3,800 feet, or that the forest has been more widely cleared to allow hamlets to establish themselves on tiny shelves where a little mowing grass is to be had. At the foot of the range a whole zone of tender crops has developed such as are scarcely known on the other side. Botanists even record among the natural flora species that belong to the South. There are small woods of chestnut and walnut. Every sort of fruit-tree—even the peach—does well; in a few sheltered corners you may see the almond blossoming and bearing fruit, and the vine itself, which is unknown at Gerardmer and Saint Die and rare even at Epinal, covers entire hills on the edge of the Alsatian plain.

Human life.—It would be surprising if the mode of life of the inhabitants showed no marked differences on the two sides of the Vosges. The Germanic population of the eastern slope, however, only dates from the Middle Ages. At the beginning of the Christian era the Celts were still in occupation of the plain of Alsace, where

their culture had received a strong Latin element. But there were probably not very many of them in the mountains, and so it was possible for the Alemanni to penetrate into the valleys that opened widely on the plain. But German speech never overflowed on to the western slopes. On the other hand, groups of *Welschen* are still to be found in the upper eastern valleys, and the lords of Lorraine long held enclaves on Alsatian territory.

Are we to attribute the contrasts between the populations of the two slopes to racial influences or to different conditions in their surroundings? On the Lorraine side it is the rule to find the dwellings widely scattered over the sunny slopes they call "the hills." On the Alsatian side only the highest farms stand isolated; the bulk of the houses are grouped into large villages in the valleys. The towns lie a long way from the crests on the Lorraine side (Epinal, Remiremont), approaching them more nearly only in the sandstone Vosges (Saint Di6). On the Alsatian side each valley has its little town lying at the point where it enters the plain, or sometimes even at the foot of the cols. These are market-towns, or busy industrial centres. The weaving of flax and the spinning of wool have long been practised in the villages of Alsace. The existence of a small coal basin at Sainte Marie has brought manufactures into the heart of the mountains. At Guebwiller, Thann and Saint Amarin the spinning and weaving of wool or cotton are carried on, and there are engineering works as well.

When they were torn by violence from France in 1871, many inhabitants of the Vosges refused to submit to their new lot. Men and capital crossed the frontier, and a ^"arkable illustration of reflex action was afforded by

the establishment of industries on the other side of the mountains. But they were more widely dispersed than in Alsace. In time each village lying near the railway in the valley of the Moselle saw the chimney of a spinning mill rise in its midst. The several hundred hands of either sex for whom it finds employment are peasants still, and always leave the mill when the heavy work on the land begins. On the sandstone tablelands of Voge industry takes on the same almost family character: old iron-works, often transformed into spinning-mills, lie hidden in the depths of woods beside some stream; the head of the business is probably the "mayor" of the neighbouring village.

In this manner, despite their moderate elevation, the Vosges are introducing into Eastern France a new element of diversity. The vegetation, the climate, even the occupations of their inhabitants reflect the striking contrast between the relief of the two sides. Never in history have Alsace and Lorraine been so closely associated as they were during the forty doleful years of annexation to the German Empire. None the less they are both French, only separated by the Vosges as the Central Massif separates the Paris Basin from Aquitaine.

## THE ALSATIAN PLAIN

From the last buttresses of the Vosges the view extends as far as the Rhine, hidden behind a curtain of trees and dominated by the stern profile of the Black Forest. You may cross the Alsatian plain in the course of

a day's walk. It is a corridor 130 miles long from north to south, affording a natural passage for the Alpine waters and a field for human activity. Between the mountain massifs with their steep, forest-clad slopes and their summits often hidden in cloud, the smooth surface of the plain lies spread beneath a brighter sky, fit ground for tillage, for villages and for high roads.

Yet if you look out over it from the walls of the old Alsatian sanctuary of Sainte Odile, you will discern in clear weather dark patches of forest staining here and there the golden carpet of the harvest, or occasionally, in springtime, flooded meadows glittering in the rays of the sun. Alsace is by no means a dead level plain wholly devoted to arable farming.

**From the Yosges to the Rhine.**—In the fifteen miles or so that separate the Vosges from the Rhine you will find a tolerable choice of scenery. The soil of the foot-hills is dry and often stony, formed from accumulations of Secondary sandstone or limestone that foundered on the edge of the Rhine trench. There the sun ripens grapes that produce wines famous all over the plain. You may recognise the wine-growing villages by the position of the front doors of the houses, which are raised above the store-rooms and have to be approached by a flight of steps.

The land lies for the most part some 600 feet above sea-level and forms a level tract. The furrows of the plough-lands run everywhere in straight lines through a yellowish loam of marvellous fertility, which the country folk call *loess.* It is the same soil we met in Picardy. The fine dust deposited by the winds covers the Tertiary clays and

coarse gravels washed down from the Vosges to a depth of many feet. Though the surface is dry, water is not far to seek. When early man arrived, he found a belt of grass, a natural pasture-land, which the most primitive tools could break up for cultivation. Traces of the Prehistoric *Age* abound. The oldest villages are to be found here, and they have retained the shape, the arrangement and the habits of cultivation which were imprinted on them in the Middle Ages. Cereals are still the principal crop, though fodder-crops and beetroot are now sown in rotation instead of leaving the land fallow. Fruit-trees grow thickly round the village or in lines along the roads; hops twine their garlands about high poles, conspicuous objects in the landscape. The old high-roads also traverse the loess belt in directions determined by the position of the towns, such as Colmar or Selestat.

The plain of loam falls eastward to an altitude of about 300 *feet,* though the eye is hardly aware of the slope. Then a marked descent brings an abrupt change in the landscape. Fields of grass lie all about you. These are often flooded in winter, and canals and arms of rivers bordered by screens of willow and poplar intersect them The *rted* succeeds the *loess.* In former times it was a belt of swampy forests, and roads and villages avoid it to this day, but the 111 Canal takes advantage of it.

A mile or two further east the water again disappears, and rolled pebbles cover the surface of the ground. In this sheet of coarse alluvium, over which they strayed at the end of the Pleistocene period, the Rhine and its tributaries are at work again, hollowing their beds to a sufficient depth for the water to dry out of its surface. Formerly it was covered by unbroken forest, and,

though clearing has made wide breaches in it, large tracts still remain: Nonnenbruch, Hardt, the Forest of Haguenau, etc.

Certainly, the plain was not equally open country everywhere. The richest belt, and that which could be most easily reached, lay along the foot of the mountains, with its dry hills to tempt the fruit-grower and its apron of fertile loams. Hamlets were also established at an early date on the slopes commanding the flood-plain of the Rhine, and there are numerous villages and towns guarding the river-crossings. They turn the meadow-lands to good account, and cultivate such parts of the river-bed as they are able to keep dry with the aid of dykes. The wet forest belt of the *tied* and the dry forest belt on the gravel terrace are still but thinly populated.

**The cross-ways in the Sundgau.**—We cannot expect to find these different belts everywhere equally developed. If the plain of Alsace falls appreciably from west to east, it has likewise a tilt from south to north. Haguenau is 300 feet above the sea, Mulhouse is nearly 800. Below Strasbourg the fall is slight; the Rhine flows in wide meanders which have been cut through in several places to shorten the distance and deepen the navigable channel. The fine alluvium of the flood-plain may carry rich meadow-lands or even arable fields. South of Brisach the river divides into a network of shifting channels between banks of coarse sand and rolled pebbles. Its fall becomes very rapid, and the plain itself falls more steeply still. It consists almost entirely of Pleistocene pebbles, and the deposit rises rapidly towards the south. Mulhouse lies on the edge of a high terrace of great age, which occupies the whole width of

the Rhine trench and is dissected into flat-topped hills by the 111 and its tributaries. This is the *Sundgau,* a meeting place no less interesting from the geological than from the historical standpoint.

Between the last crests of the Jura, which close the southward view, and the *ballons* of the southern Vosges there opens on the west the famous Belfort Gap. The pebble bed of the Sundgau enters it, and fragments of that bed may even be found in the basin of the Saone. There is, therefore, no doubt that the waters of the Rhine found a passage to the south at the time when the glaciers that covered the whole of Switzerland were melting.

From the days when men first began to bestir themselves on the soil of Europe, establishing trade relations, ebbing and flowing in migrations whose causes remain a mystery, or facing one another on the field of battle, the Sundgau has been a place of frequent meetings and fierce contentions. The Saone end of this corridor is guarded by Belfort, the Rhine end by Mulhouse. In the days of the great Revolution Mulhouse, then a free city, gave herself enthusiastically to France. As the commercial and industrial capital of Upper Alsace she has grown very considerably since that date. Her spinning-mills, her engineering and railway-carriage works, her banks, residential quarters and large shops, place her in the ranks of the great towns. She has played her part in the industrial progress of the small towns of the Vosges, and has done much since 1871 to develop industry in French Lorraine.

A new source of wealth of subterranean origin has come to light almost at her doors. At the bottom of the valleys in the Sundgau the soft Tertiary deposits of the foundered Rhine trench are in some places exposed by

denudation. Borings made in search of coal or lignite have revealed in these beds, north of Mulhouse, a solid mass of potassium salts. The Germans, anxious to secure a virtual monopoly for the salts of Thuringia, **put** obstacles in the way of their extraction, **but** it is now to be pushed ahead and will prove of the greatest profit to French agriculture and the industry of Alsace.

**Strasbourg.**—The Sundgau crossways have their counterpart in Lower Alsace. North of Strasbourg the plain widens suddenly to a breadth of fifteen miles. The edge of the sandstone Vosges is cut away by a bow-shaped subsidence in which geologists have found evidence of repeated fracture. Saverne lies at the bottom of this pocket, at the foot of the lowest col that crosses the Vosges. It takes only a few minutes for an express train to climb the gradient through the woods, enter a short tunnel and bring you out on to one of the limestone platforms of Lorraine. The Rhine-Marne canal crosses the same sill, and it has been used for centuries by all who sought the shortest route to the west. Nature would seem to have been bent on making the symmetry of the massifs that border the Rhine trench complete in every detail, for there is a similar lowering of the rampart of the Black Forest also, not exactly opposite, but only a short distance further north than the Saverne gap. Moreover, the limestone platform of the Kraichgau ends beside the plain of Baden at Durlach, thus leaving a thoroughfare which trade routes and tribal migrations have utilised since the dawn of history and the main line to the Orient naturally follows to-day.

So from Saverne to Durlach we find a route of Nature's own providing crossing that other highway of Europe

which follows the plain of Alsace and continues by way of the plains of the Palatinate and Hesse. The point of intersection was naturally indicated as the site of a town, and to this advantage Strasbourg owes much of its importance.

With the return of Alsace to France its capital is bound to increase in importance. German domination tended to hinder the progress which the development of navigation on the Rhine should encourage. The work of regulating that great waterway was pushed ahead up to Mannheim and brought the head of navigation further upstream, but it has taken a long time to continue the scheme as far as Strasbourg. Thus the Alsatian port was forced to depend for its development exclusively upon its own local resources, while an attempt was made to set up a rival to it by creating at great expense a port at Kehl in the territory of Baden. The Strasbourg traffic had already risen from 317,000 tons in 1900 to close on 2,000,000 in 1913. In 1929 it had more than doubled itself again, and will probably be trebled when the new docks of the free port are opened to shipping. Strasbourg indeed is the obvious head of navigation on the Rhine. The fall is too rapid, and the water too low in winter ever to allow active traffic to be maintained beyond that point. At Strasbourg heavy goods will have to be transferred to railways or canals. The 111 canal already runs alongside the Rhine up to Basle; the Rhine-Marne canal crosses the Vosges by the Saverne col, and the Eastern canal, the Sarre coalmines canal and all the canal system of the Paris Basin are in communication with it. In this manner the economic life of Alsace is bound as closely to France as is its intellectual life.

Viewed as a whole, the plain of Alsace is a crossing of ways. Many influences have been brought to bear upon

it for many centuries. The population, incontestably Celtic till the beginning of the Christian era, owes its apparent Germanic character to the dialect imposed upon it by its Alemannic invaders; but this sunny open country with its southern affinities has always remained quite different from Germany proper. For hundreds of years it was a bone of contention between the Holy Roman Empire and France, but it inclined to France, and the ties became so strong that the rape of 1871 and forty-five years of German rule have only made its western outlook more pronounced. France is now in firm possession of one of the most hotly contested and wealthiest meeting-places of routes in Europe.

# CHAPTER VI

## BRITTANY

HERE we have a case of rare occurrence in a country so varied in its nature and so historically ancient as France—an historical region exactly corresponding to a great natural region. We have borrowed the names of ancient provinces (Picardy, Champagne, Lorraine) to denote geographical regions covering roughly the same area, but usually extending beyond their limits. The area of historical Biittany corresponds as closely as it well could to an obvious geographical unit. Everything in it is different from the rest of France—landscape, race, language, the very dress of the inhabitants. Breton women may still be recognised in the streets of Paris by their embroidered head-dress; and once you have grown familiar with the features of the Breton landscape, you cannot ever forget them—the monotonous horizons of the *bocage,* the flower-strewn moorlands, that look so dreary under a clouded sky, the wild sea-fretted coasts and the deep estuaries, where at low tide the fishing boats lie stranded on the soft mud.

One may define Brittany with tolerable precision as the peninsular part of the Armoncan Massif. All its characteristics are due to its Armoncan structure and to the fact that it is bounded on three sides by the sea.

### THE ARMORICAN MASSIF

What is the Armorican MassiP A glance at the geological map will tell us. It shows, west of the Paris

Basin, a series of belts of Primary strata flecked with patches of crystalline rocks. These belts cover the whole of Brittany and La Vendee, and parts of Normandy and Maine as far as a line running roughly through Caen, Falaise, Alengon, Angers and Niort. The subsoil is the same as in the Vosges and the Central Massif. The much-folded Primary strata come to the surface in parallel belts, which sometimes contain small coal-basins.

**The Bocage.**—The geological unity corresponds to a remarkable geographical unity. When we enter the Armorican Massif we rarely find the fact indicated by any sudden accentuation of the relief, but the most absent-minded traveller cannot fail to be struck by the change in the scenery. Those wide horizons that met the view on the uplands of the Paris Basin have disappeared. The outlook is bounded by screens of woodland or by folds of the ground. If you happen to be standing on some hillock a little detached from its neighbours, you see before you a labyrinth of little valleys and knolls covered with a sort of open forest. Actually the ground is cut up into a chess-board of little fields and meadows surrounded by hedgerow trees. This is the kind of scenery denoted by the word *bocage*. It is not confined to the Armorican Massif—it is to be found further east in Perche; but it is only in the domain of the ancient strata that the parcelling out of the land becomes the general rule. The confused effect of the scenery is there increased by the indefinite land-forms resulting from the conditions that moulded it.

**The Peneplane.**—When it happens to be possible to see more than a few miles all round, we search in vain for any sharp relief upon the skyline, which is almost as

smooth as it is at sea. Nothing checks the sight; all the ridges are more or less on the same level. Yet this uniformity hides strata as violently dislocated as any we find in the highest ranges. At the close of the Primary era, the Armorican Massif was certainly a mountain region, but since that day erosion has had time to destroy its relief and level it completely. At Falaise, Alencon or Angers you will find its flattened surface dipping under the beds of the Paris Basin, which evidently extended west in former times. The Armorican Massif corresponds as a whole to what geographers call a "peneplane," the last stage in that cycle of erosion whose task it is to wipe out all relief.

The relief.—The surface of the Massif which submitted to this levelling process was not uplifted and broken on one side as were the Vosges; but the repercussions of the earth-movements of the Tertiary epoch reached it in sufficient intensity to cause a slight elevation, just enough to compel the streams to re-excavate their beds. The valleys we see to-day are the work of a new cycle of erosion. The more pronounced irregularities of relief we meet with here and there must be attributed to the resistance which this process encountered. Features of this nature may easily be discovered if we look for them. They obviously exert a considerable influence on the general appearance of the country, making communications easy or difficult and facilitating the extension of cultivation or, on the other hand, of forests and moorland.

Their size is never very considerable. The highest point of the Armorican Massif is the *Butte des Avaloirs,* which lies in Upper Maine and is 1,368 feet high. In

Brittany itself the *Monts d'Arree* do not reach 1,300 feet *(Butte de Saint-Michel,* 1,283 feet). These ranges nearly always consist of hard sandstones, but occasionally of granite. In the former case they lie in straight lines east and west in the direction of the old folds; in the latter, they take the form of spreading domes. The thin, pebbly or gravelly soil, sometimes too dry, at others too wet, the mists and the violent winds turn these summits, for all their low elevation, into miniature mountains.

As dwelling places they are avoided, and when the forest disappears, its place is taken by moors, a carpet of prickly gorse, broom or heather. The further west we go, the higher this moorland extends, with here and there a peat-filled basin intersecting it. Clumsy clearing has helped it to spread, but its hold was assured in a climate that grows wetter and windier as we proceed.

**The depressions.—If** the higher parts of Armorica are formed of hard rocks, the lower lying areas are generally formed of less resistant beds. Rennes and Chciteaulin occupy the centre of the depression, which is intersected by countless valleys of flattened section hollowed in the clayey schists. This is the typical *bocage* district, where farms are frequent, with a network of hedge-bordered lanes connecting them.

Where the beds of schist and sandstone uplifted by folding were exposed in narrow belts on the surface of the peneplane, the forces of erosion have developed a very characteristic form of relief. If you follow the Vilaine south of Rennes (Fig 8), or the Ille south of Dinan, you will see how the valley narrows and its sides grow steep wherever the sandstone breaks the surface among the

scattered clumps of pine upon the moors. Then the slopes fall apart once more, and tributary valleys afford sideway glimpses of meadowlands and fields, with farms dotted all about and the spire of a village church peeping from the trees. Here the shallowest excavation will reveal the schists. This change of scenery repeats itself whenever the geological map shows a belt of schist succeeding a belt of sandstone. Where the sides are steepest, the valleys are rarely more than 200 to 250 feet

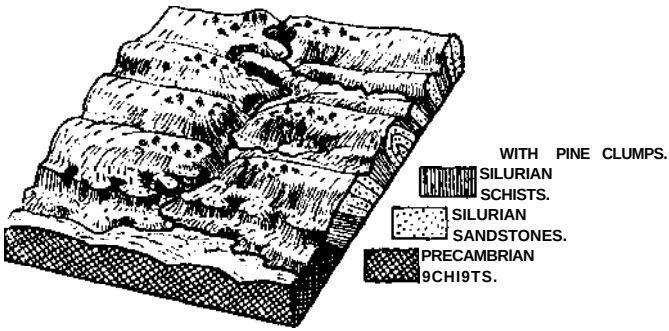


FIG. 8
ARMORICAN RIVERS

deep, or so narrow that the high road cannot easily find its way along them. But the old communication routes preferred the high ground, and their tracks can be followed for miles over the moors.

**Human life.**—This is all that is left in the way of relief. The dampness of the climate and the general impermeability of the soil make each fold in the ground the birthplace of a spring or the home of a stream. The hollows in which the granite silt or the clays

resulting from the down-creep of the schists accumulate are always more or less spongy. Nothing hinders the wide dissemination of dwellings, which is the rule through all the Armorican Massif. Grassland is everywhere to be found, and cattle breeding is within the reach of all. Trees grow sturdily if left to their own devices, and gorse and broom spring up more quickly still on every bit of waste, forming in a few years' time a dense heath. These conditions account for the way men earn their livelihood in Armorica. The *bocage* is the background of their existence.

There are no nucleated villages like those of the Paris Basin. Beside the church you will often find only two or three houses, the school and the parish offices, one or two inns and perhaps, on a high road, a smithy Here each peasant prefers to live in his own little domain and work it in his own way. Round the farm he has his grass and his arable, every field enclosed with hedges of trees growing on banks of earth. The cattle can be left at liberty in the pasture, for its single entrance is closed by a gate. The hedgerow trees, lopped at frequent intervals, supply him with firing. An abandoned fallow soon turns to a heath, and the young growth of the broom is a welcome addition to the feed of his cattle; the larger branches, when dry, make a rare blaze on his hearth, and the rest is used for litter.

Each family lives this isolated life, entering into contact with the outside world on fair-days only. Of the old condition of things, when the peasant was still a serf, something yet remains. The great estates generally occupy three-quarters of the parish, and the farmer feels himself more completely at the mercy of a master than he does elsewhere. New ideas do not penetrate to the

heart of the *bocage.* There the bands of *Chouans* gathered, who fought so desperately for the King at the time of the French Revolution. With universal suffrage at last applied to the whole of France, Armonca has shown itself conservative, deeply attached to its Catholic faith and obedient to the bidding of priest or proprietor. A. Siegfried has analysed the election results district by district throughout the West of France and shown that the boundary of the Armorican Massif exactly coincides over the greater part of its course with that of the constituencies which regularly return conservative members to the Lower House.

Such are the features that characterise the country of Armonca, and the life of its inhabitants. But though they reach their highest expression in Brittany, they are not peculiar to that region. What is peculiar is Brittany's situation. She lies lengthwise between two seas, and her only bond with France is an isthmus less than ioo miles in width, an outlet all too small for a country where physical obstacles make communications difficult. The influences of the mainland penetrate but slowly into the interior of the peninsula. Her outlook is toward the sea that washes her coasts on three sides, and enters by a thousand bays and branching inlets into the heart of the land.

## ARMOR

All that we know of the history of the settlement of Brittany shows the preponderating part that the sea has played in it. It was over the sea from Ireland and Wales that the Britons came who gave their name to the

country, and implanted in it the language that is still preserved in the country districts, a speech as different from our own Romance as from the Teutonic languages.

Christianity also arrived by sea, brought by the monks of Wales, the country from which the last waves of colonisation had arrived. At certain points of the coast unusual types with prominent cheek-bones are still to be seen, who set us wondering what distant influences they display. "Saracens" are naturally mentioned, and even "Phoenicians/' What navigators sowed these shores with an exotic seed? . . .

The sea makes its presence felt all over Brittany, though the tumult of the waves grows dim, the damp breath of the ocean is no longer felt, as one goes inland. For long the difficulties of communication kept foreigners and foreign things from entering the interior. The Breton distinguishes two essentially different aspects of his country. The settlers from Ireland were struck by the open character of the coastal belt, where high winds prevent the growth of trees. The further one advances from the coast, the more difficult do communications become. The moorlands, woods and marshes terrified the missionaries, and the chroniclers write of them as deserts or thick forests. Two Breton names translate these two impressions: on the one hand there is the country "of the sea," *Ar-mor;* on the other, the country "of the woods/' *Ar-coet,* and a radically different kind of life belongs to each.

**Marine erosion.**—Armor well deserves its name. The sea is never out of sight. It adds many miles to its line of contact with the land by creeping into a thousand inlets, but all of them are not its own handiwork. The

furious onslaught of the waves is directed against the promontories of hard rock that correspond to the ranges of the mainland. The compactest granite, the solidest sandstone cannot withstand the blows of that terrific battering-ram; caverns are hollowed at the base of the cliffs, natural bridges are formed to crumble in their turn. The point becomes a little island, against which the billows rage till they have reduced it to a tide-rock. Thus lines of reef run out to sea beyond all the three capes: the Pointe du Raz, the Pointe du Toulinguet, and the Pointe Saint Mathieu. Little coves are developing even in promontories as solid as the peninsula of Treguier, the first step towards their disintegration into islets.

But the sea never excavated wide bays like those of Douarnenez or Saint Bneuc, nor yet the estuaries which penetrate between steep cliffs ten or a dozen miles back into the land. The Bretons call these estuaries "rivers," and they are right, for they are nothing but deep valleys, invaded by the sea, just as the bays are depressed land surfaces which the sea has drowned. Into the estuaries the tide carries the mud on which the boats are stranded at low water. At the head of the bays the sea deposits grain by grain the sand of the beautiful wave-lapped beaches.

The work of the Atlantic thus tends on the whole to smooth out the capricious windings of the coast-line. But the centuries pass by, and the headlands seem to suffer no perceptible loss; the bays are not filled up. What we do perceive is the all-pervading presence of the sea. Surely to that must be attributed all the peculiar characteristics of the country.

**The "Golden Girdle/'**—Armor is the most wide-awake and the richest part of Brittany. When we come to count the towns, we can name only two or three that lie anywhere else: Rennes, Pontivy, Chateaulin. If you reckon population living more than live or ten miles from the coast, you will be surprised to find that Arcoet has scarcely a greater number of inhabitants than Armor, though its area is four or five times as large. E. Robert* has shown that Armor has from 400 to 500 people to the square mile. There is ample justification, then, for speaking of Brittany's "golden girdle."

Armor enjoys the advantage of fisheries, shipping, and trade, which is the mother of towns. A cordon of ports encircles Brittany. Sardines, tunnies and lobsters are taken all along the south coast. From the north, the fishing-smacks put out each year to cross the Atlantic and fish for cod as far as the coast of Iceland Saint Malo and Saint Brieuc engage in active trade with England. Lorient and Brest are naval ports whose dock-yards launch and equip ironclads and destroyers

The "seamen's enlistment" system, started in the seventeenth century, enrolls the whole male population in the Navy. They may be called up whenever required, after their active service is completed, but a pension is secured to them which is the envy of the landsmen. While the husband is at sea, the wife cultivates the little field round the house, which shelters a family that in-creases year by year.

Armor does not draw its whole livelihood from the sea. Agriculture has always flourished in a climate which is damper, but milder, than that which prevails inland. Frosts are unknown. In the sheltered gardens they will

* *Annales de Geographic,* **Vol. X I I (1904)**

show you fig-trees,* and the wine of the Rhuis peninsula was formerly celebrated. In the seventeenth century the loams of Tregorrois and Leon were the wheat granaries of Paris, and grain and flour were exported from the harbours of Morlaix, Guingamp, Lannion and Saint Brieuc. Flax was also grown from seed brought from the Baltic.

To-day, more valuable crops often take the place of cereals. Vegetables and fruit ripen soon enough to appear in the Paris market immediately after the early deliveries from the South of France, and before the produce of the suburban growers. So the scaly globes of artichokes cover vast areas round Saint Brieuc, strawberries invade the hillsides of Plougastel, and green peas and potatoes flourish in the neighbourhood of Pont l'Abbe. Roscoff sells more than a million francs' worth of early vegetables in England.

There is no lack of labourers for all the work these crops necessitate. Manure also is furnished by Armor's universal provider. The mud which encumbers the estuaries and the bottom of the tranquil bays is full of calcareous shells and makes an excellent top-dressing. The seaweed that clings to the rocks is harvested at low tide, and dug in, or burnt to yield ashes rich in potash. Thanks to the ramifications of the estuaries, manures of marine origin are available for some distance inland. Round the Morbihan, the limit of their employment is also the limit of the wheat and early vegetable crops.

The divergence between Armor and Arcoet seems to have gone on increasing until the nineteenth century, but since communications have become easier it has

*** Less common, it would appear, in other parts of Northern France than in most of Southern England.** ***(Translator's Note.)***

tended to diminish. In the eighteenth century it took three days to cross Brittany from north to south. The main railway lines, even now, run longitudinally, but narrow-gauge lines and carefully-tended roads exist almost everywhere. Chemical manures are reaching the inland districts and making possible the wider cultivation of clover and lucerne and the development of stock-breeding on a remunerative scale.

## BRETON-SPEAKING BRITTANY AND THE "PAYS GALLO"

The contrast between the coast and the interior still persists, but it does not override the differences between East and West Brittany. The nearer you approach to Finistere, the more marked become the peculiar characteristics of Armor and their divergence from those of Arcoet.

In the west, the coast-line is more irregular, and more savagely assaulted by the sea; the interior more rugged, and the uplands covered with mist-drenched moors On the coast there is a harbour in every cove; inland there are great expanses almost unvisited. Continental influences did not reach these parts before the nineteenth century. Breton is spoken everywhere west of a line that runs roughly from Saint Brieuc to Lorient, and in a few hamlets you may still find old people who know no word of French.

East Brittany is a more open country. The coasts are less rugged and the surface moulded to gentler curves. The Vilaine and the Ille mark the axis of a zone of depression into which the Tertiary seas penetrated, leaving behind them a few deposits of lime and sand which help to manure the soil in the neighbourhood of

Rennes. The capital of Brittany naturally grew up at the point where communications are comparatively easy between the north and the south, as well as from east to west. It is the centre of the *Pays Gallo,* where French has been the language spoken for hundreds of years.

Though her contrasts and her peculiar characteristics are still so pronounced, Brittany is now an integral part of France. Modern ways of communication: railways, mam roads, by-roads, and even canals have made the best use of the broad isthmus that joins her to the mainland. Compulsory military service has spread the use of French all over the country. Paris absorbs the products of the soil, which in cattle, cereals, early fruits and vegetables grow more valuable every day, while she also absorbs the products of the fisheries. She even attracts labour from a country whose population is still increasing. Unfortunately, association with the capital is causing the gradual disappearance of local customs and costumes, but it can never destroy the peculiar geographical features of the Armorican peninsula.

# CHAPTER VII

## LIMOUSIN

**Characteristics of the Central Massif.**—A glance at the map of France shows as an essential feature of the relief that mass of highlands which owes to its situation the name of the *Central Massif* The streams flow in all directions; northward to the Loire and the Seine, westward to the Garonne, eastward to the Saone and the Rhone. Though of less elevation than the Alps, and higher than the Vosges or Armorica, this great natural region resembles those ancient massifs most closely. Its confines, sufficiently indicated by the 1,000-foot contour (300 metres), are also clearly shown on the geological map by the limits of the crystalline rocks. It is one of the oldest parts of France, and its relief can only be due to recent movements, repercussions of the Alpine folding, as in the case of the Vosges.

When you look for the highest peaks, which reach 5,500 or 6,000 feet, you will notice that they all lie to the south-east, facing the Alps across the trench of the Rhone. On this side the Central Massif falls steeply, thanks to a fracture like that which accounts for the eastern edge of the Vosges. It slopes more gently to the north and west. The fan of left-bank tributaries to the Loire (Alher, Cher, Creuse and Vienne), and that represented by the tributaries to the Garonne (Dordogne, Lot, Aveyron and Tarn), indicate this two-fold fall toward the Aquitaine and Paris Basins, whose Secondary

strata cover the edge of the planated bed-rock.

A sort of tilting process, therefore, has determined the geographical features of the Central Massif. It would be surprising if such a movement could be set up in a rigid block of crystalline rocks without other damage than the breaking of the eastern edge. Indeed, the Archaean bed-rock has been dislocated by a number of fractures, and founderings like that of the Rhine trench have occurred, but without materially affecting its unity. The geological map shows patches of eruptive rocks, indicating that volcanoes have developed in the neighbourhood of these dislocations. The highest summit of the Central Massif, the Puy de Sancy (over 6,000 feet), is a volcanic cone.

The Central Massif has never been an historical unit. Its relief is too disconnected, its scenery too varied. It touches the south country that looks out on the Mediterranean, and the most continental portions of the Paris Basm, and it nearly touches the Atlantic. The diverging river-valleys guide its lines of communication towards the four points of the compass. A host of local communities have developed, each with its own centre. There are a few ancient provinces corresponding to natural regions, but such conditions are somewhat exceptional.

We shall get an adequate notion of the different aspects of the Central Massif if we study four regions, each presenting a characteristic combination of geographical features due to the vicissitudes of its geological history (Fig. 9). The simplest type is represented by *Limousin-* the most complicated, by *Auvergne.* In the first case we have to do with the old undislocated surface; in the second the massif is violently rifted and bristles with

volcanoes. The *Causses* are arid tablelands with magnificent gorges, and consist of the limestones superimposed in Secondary times and incorporated in the massif by earth-movements. The *Cevennes* are the steep south-eastern face, a distinctive mountain region of the Mediterranean type.

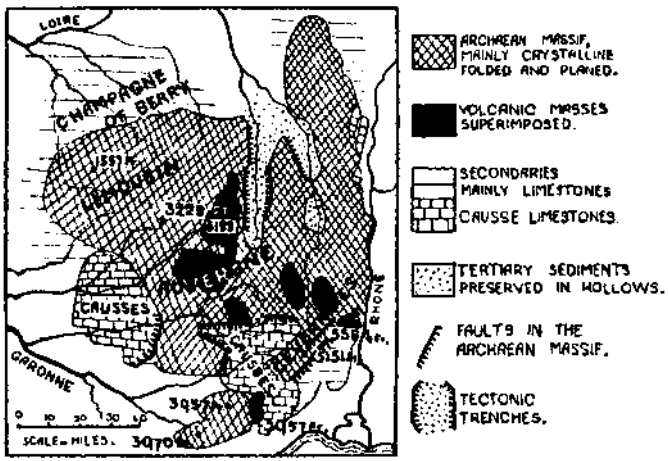


FIG. 9
THE CENTRAL MASSIF

**The Limousin tableland.**—The Toulouse express carries you in a few hours across the whole width of the Paris Basin, and by the time you reach Argent on you are in Limousin. But you must not expect the entrance to the crystalline massif to be marked by any special character in the relief. The conspicuous ridge running eastwards consists of the limestone beds of the *Champagne* of Berry that you have just crossed. Little by little you

feel that you are entering a new world, but the effect is produced solely by the details of the landscape. The tufts of tall fern and the flowery heather betray the siliceous soil. The grass-lands, which round Chateauroux and Issoudun were confined to the valley bottoms, now appear on every side, replacing the cornfields on the hillsides.

Hedgerows now surround the fields, and these grow steadily smaller as you proceed. The horizon grows more and more confined. You are in a wooded country, reminding you of Brittany, though there is a more cheerful note in it beautiful clumps of chestnut trees in lusty leaf, deep green meadows suggestive of mountain pasture, heavier cattle, whose red coats are in every landscape, and frequent hamlets in place of solitary farms.

At rare intervals some pinnacle of blackish rock appears. A thick soil masks the irregularities of the relief leaving only cradle-shaped valleys, and rounded knolls in view. You see to your surprise a deep gorge opening suddenly at your feet with granite showing on its steep faces. An aneroid would tell you that you had climbed more than 300 feet without being aware of the fact. The flattened surface of the ancient massif rises in this gradual manner towards the south, but the rise is enough to compel the streams to cut deep gullies, the commencement of a new *cycle of erosion.* At times a clearer contrast is obtained between the degraded contours of the tableland, the last stage of a cycle of erosion that has reached the levelled condition of a *peneplane,* and the youthful valley-forms in which the excavation process is not yet at an end. Thus the meanders of the Creuse sometimes embrace bold hills with their flanks covered with rock-strewn heaths, and

the ruins of a castle on the summit.

When a wider prospect is revealed, the uniformity of the uplands is no less striking. The name "Central Tableland/' sometimes used in place of "Central Massif," is most readily intelligible in Limousin.

**"The Mountains."**—For all that, the horizon is not absolutely featureless. The outline of some sombre-coloured elevation is nearly always visible in the distance. Before Limoges is reached, the train must climb a long gradient on the flanks of forest-clad hills intersected by ravines with running water. Commanding heights, from 2,300 to 2,600 feet above sea level, are to be found widely distributed over the Limousin tableland. Early geographers entered them in their atlases under such vague names as "the Mountains of Marche," or "of Limousin," but locally they are more precisely known as "the Mountains of Blond,' or "of Ambazac;" "the Plateau of Gentioux," or "of Millevache."

Their rounded summits, often almost as regular as the tableland itself, are the relics of surfaces planed by erosion at a geological period even earlier than that which witnessed the development of the platform from which they rise. The native himself classes these highlands together, bestowing on them all the general name of "the mountains." Their flanks are still covered in many places with forest, chestnuts yielding place to beeches above 1,600 feet. On the tops the heather reigns supreme with blocks of granite rising out of it here and there. The broad depressions which give birth to the streams that carve their gullies in the mountain edge are simply sponges. The granite waste that has accumulated in them to a depth of many feet is saturated with water,

which oozes from the surface. Clouds linger over this dreary country precipitating heavy downfalls of rain in summer, and of snow in winter. The mountains are often a pure white line on the horizon, and villages are sometimes cut off by snow for several weeks together.

The dweller in the mountains is conscious of his isolation from the lowlands at his feet. He harvests his rye three weeks later. He learnt hundreds of years ago to irrigate his grass-fields on the slopes and drain them when they lie in the bottoms, if the ground provides fall enough. He does not raise cattle for butcher's meat, but takes his young beasts down to sell at the fairs to those who will fatten them on better land.

The mountains furnish the principal contingent of emigrants to Paris, where the men of Limousin find employment as artisans, coachmen or masons. But they come home again to buy a bit of grazing with their savings, for in the mountains, as elsewhere, the native loves best of all to have some land of his own.

**"Besse."**—Life is easier and more spacious on the tableland, which the mountain folk call *Besse.* Between 800 and 1,600 feet the winters are not so severe, the summers are hot, the soil is deeper, and the moisture more evenly distributed.

For centuries a mode of life has been practised here which has learnt to avail itself of natural resources more varied than in Armorica, though it adapts itself equally well to a similar isolation. The land is partly fields, devoted mainly to cereals, and partly meadows, generally irrigated, which can be mown twice a year. Use is also made of the moorland. Clumps of chestnut-trees are

preserved in all parts of the country, which yield both wood and fruit. Farmyard manure has always been used on the arable and grassland, but the practice of liming, which gives granite soils the one element they lack, is only becoming general with the improvement in communications. With its aid wheat is steadily replacing rye, and artificial fodder is fostering the development of the main source of local prosperity, the stock-leasing system. The Limousin breed of cattle is famous all over central and southern France, and the fairs of Limoges attract buyers from the Charentes, and even from Languedoc.

The capital of Limousin grew up in a sort of basin, the natural meeting-place of the road up the valley of the Vienne, the road going north by the *col* of Saint Sulpice de Lauriere, and the south road over the plateau of Saint Yneix. It has become an industrial centre, using the local deposits of kaolin for the manufacture of glazed pottery and china.

Round about it quite a number of little towns have developed from old market-centres, generally situated where "Besse" and the "Mountains" meet, Aubusson, Gueret, Saint Sulpice, Rochechouart and Saint-Yrieix. But the places that have grown up on the actual edge of the Archaean massif display more vigorous life. Such are Argenton, on the borders of Berry, and still more noticeably Brive. The latter is the market town of a fertile basin eroded in the soft beds of the Trias. There the fields of maize and the fine orchards and vineyards ripening their fruits under a hot sun produce quite a southern effect.

The contact with the South of France is one of the features of Limousin, which linger in the memory. A

dialect of the *langue d'oc* is spoken in the country districts and both the tableland and the mountains seem to have been settled by incomers mainly from the south. In this respect, as also in the possession of a sky more free from cloud, Limousin differs notably from Armorica, though they resemble each other in their relief and their geological history.

# CHAPTER VIII

## AUVERGNE

THE railway line from Paris to Nimes takes you straight into the heart of Auvergne. The first part of the journey is tedious, but open your eyes when you are coming to Gannat. A line of steep hills blocks the horizon to the right, dominating the gently rolling plain, more and more of which is coming under cultivation. Narrow ravines cut into the range but do not break its continuity. Villages and small towns are strung out along its foot. After Gannat comes Riom; after Riom, Clermont-Ferrand.

The capital of Auvergne is remarkable even m a distant view, with its houses rising one above another up the side of a hill, its towers and churches and its factory chimneys. But the panorama of the hills which surround it is more striking than the town itself. Conical peaks resembling nothing to be seen elsewhere stand up against the skyline. The highest is the Puy de Dome, rising 4,800 feet. A rack-and-pinion railway will take you quickly to the summit. The tableland whose steep edge came into view as you approached Gannat is reached by way of the green gorge of Royat with its jagged crags of Archaean rock. The view over these uplands would remind you of Limousin, were it not for the Puy, which rises in an unbroken sweep 2,600 feet above the tableland, a gigantic cone round which the track climbs in a spiral.

From the top, where the meteorological observatory lies in close proximity to the ruins of a Roman temple, you look out over the strangest of landscapes. In winter, when the snow conceals the vegetation and the cultivated fields, you are reminded of the lunar landscapes revealed by tele-photographs. These pustular excrescences breaking out over the face of the country, cones with their summits slightly worn or hollowed into bowl-shaped depressions, are volcanoes whose craters must still have been smoking when early man first saw them. So fresh-looking are their contours, so similar to the cones in regions where vulcanism is still active, that the first French geologists in the eighteenth century described the chain of the Puys as a group of volcanoes only recently extinct.

From the Puy de Dome the view is very extensive. Beyond Clermont-Ferrand stretches the plain of *Lirnagne,* bounded both east and west by the steep edge of a tableland of crystalline rock. To the south the monotonous horizon of the Central Massif is broken by yet more volcanoes far bigger and older than the chain of the Puys. You have before you every type of Auvergne landscape: tablelands of crystalline rock like Limousin; plains that have foundered between parallel faults, and volcanic blocks. But the volcanoes provide the most characteristic features; the highest summits of Auvergne are of their creation, and they have almost turned it into a mountain district. To them again must be attributed the most fertile soils, so eagerly sought after for tillage or stock-raising. So strong, so obvious is their impress on the scenery and the life of the country, that two of the departments which have been formed out of the old province of Auvergne, instead of being called after some

FIG. 10.—THE PUYS, enlarged from the carte de I'etat major, 80,000, sheet 166, Clermont, S.W.
Scale: One inch to one mile

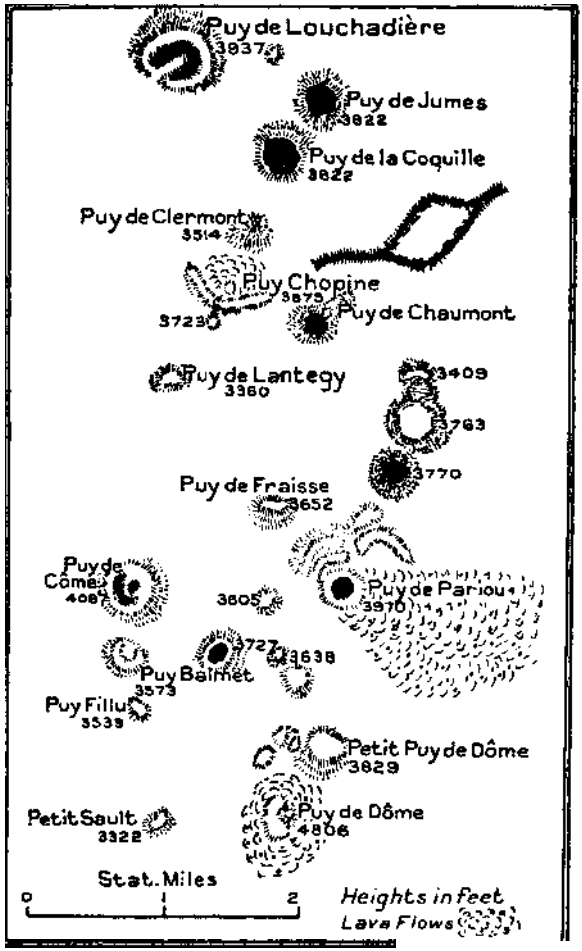


FIG. 11
THE PUYS—Key plan to Fig. 10 showing heights in English feet

river in the usual way, have taken the names of Puy de Dome and Cantal.

**The Chain of the Puys.**—There is an almost infinite variety in the sizes, shapes and age of the volcanic blocks. The chain of the Puys is a world in itself. In clear weather we may distinguish some of the details from the summit of the Puy de Dome. Failing a flight in an aeroplane, which would display them all to us, the French ordnance map has much to show to anyone who can read it (Fig. 10). Some craters, we notice, are regular and form perfect circles, like Coquille; others have a double rampart, like the Puy de Come, and sometimes the older wall is half in ruins, as in the case of Pariou. There are piles of red and black *sconce* or loose grey ash, on which the forest with difficulty secures a foothold. Alongside them we find abortive cones like the Puy de Dome itself, blisters of lava that reached the vent at a temperature so low as to cool there without flowing. More fluid streams have escaped from the real craters. We may easily trace those that started from the Pariou or the Puy de Lassolas. They partly filled the valleys, and some of them they blocked, causing lakes to form, as at Aydat (Fig. 12). Their wrinkled surface seems sometimes hardly to have cooled. A few stunted bushes contrive to exist upon them. These are called *Cheyres*, regular deserts of black stones. The water which soaks into them reappears on their edges in fine springs, and determines the site of farms or hamlets. The surface of the older flows, on the other hand, now disintegrated and levelled, affords a rich soil, more fertile even than the granite silts.

The varied nature of the soils and formations attracted

men to the uplands despite the rigours of the climate and the long time they remain under snow. Rye and potatoes for local consumption are still grown, but stock-raising is the chief stand-by of the little villages that seek the

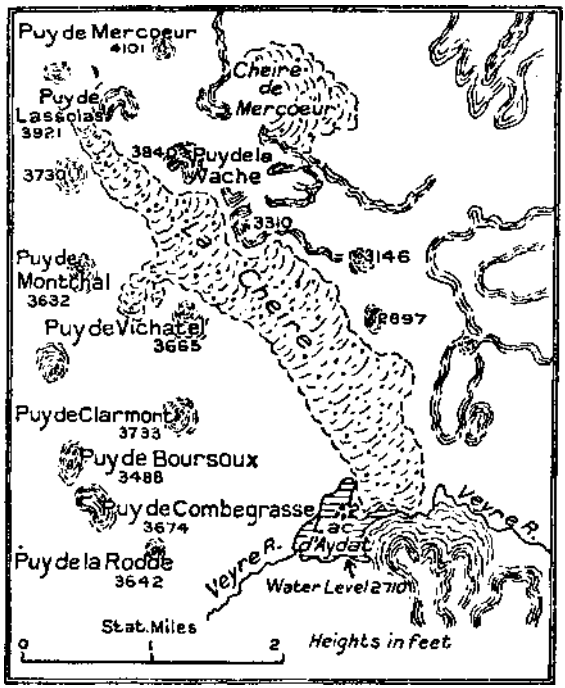


FIG. 12
LAVA-FLOW BLOCKING RIVER

seclusion of the hollows to be near the springs. The population gravitates chiefly to the Limagne border, where each ravine shelters a village with its belt of fruit-trees.

**Cantal.**—The chain of the **Puys** is a **swarm of little** volcanoes barely extinct: Cantal is a single, solid block on which the forces of erosion have made a vigorous onslaught without, however, removing all traces of its origin. From every elevation within a radius of 130 miles it stands out against the skyline. The eye follows its rising crests till they seem to converge upon a central point which is no longer there. The summit of the volcano in the days of its activity can scarcely have been lower than 10,000 feet, for the existing mass is more than thirty miles across. It is built on a scale that invites comparison with Mount Etna.

The map reveals the tactics employed by the forces of erosion. The water flowing off in every direction has excavated valleys on the pattern of a star, radiating **all** round the vanished summit. Their steep flanks show black scarps of basalt alternating with volcanic tuff and scoria? arranged more or less in coloured streaks. When the process of excavation reaches the base of the volcano, which is built on Tertiary deposits like those of Limagne, the valleys broaden out. Nothing could exceed the smiling fieshness of these beautiful valleys of Cantal. In them the sun shines bright and warm, while the clouds hang persistently about the mountain top. Strong springs gush forth at the foot of the slopes. The flat bottoms are covered with meadows, and screens of poplars indicate the water-courses. The fields, still frequently fenced, spiead up the clay inclines. The villages arc lost in bowers of orchards, which yield the finest of fruit, including peaches and sometimes even almonds.

Between these fertile valleys extend the *planaises,* tablelands that dip in conformity with the original

inclination of the lava-flows down the sides of the volcano The map shows them clearly defined as triangles with their apexes turned towards the point of divergence of the several valleys. The high plains which form their lower ends at the circumference are under cultivation. The disintegrated basalt yields a stony earth, but one which contains all the elements of the perfect soil. Cereals will ripen on it as high as 2,300 or 2,600 feet. The *Planaise de Saint-Flour* is famous throughout Auvergne The stones picked from the fields make the black walls that fence the roads and enclose the pastures and lend a mournful and sombre appearance to the buildings.

In their upper levels the *Planaises* form a true mountain region covered with snow for six months of the year. There are no villages, no farms, no cultivation. Forests cover the steep drop from the tableland to the valleys below, but the uplands are mostly pastureland The deep basalt soil yields a sweeter grass than the granite. This is the *montagne d gratsse,* the fattening ground, where the cattle put on weight. The beasts are driven twenty miles or more up from the valleys every summer. Whole families take possession of the *burons,* which are wooden chalets like those of the Alps, and there a celebrated cheese is made.

The *planaise* narrows at the end like the prow of a ship. Sometimes, indeed, only a peak is left, like the Plomb du Cant al.

Where the crater of the old volcano once stood, there now rise cones, like Griou, nearly 6,000 feet high, a relic of the lava-plug that once filled an ancient vent. In some seasons the snow never melts at all in the heads of the valleys, which widen out into corries, a sign of

former glaciation. Indeed, the feeling of being in a real mountain-region is remarkably strong.

I hough the unity of Cantal is still quite a real thing, it plainly does not preclude a striking diversity. A large number of small towns have developed out of market-centres established at the meeting points of different regions. They form a kind of double crown. The inner circle coincides with the upper limit of the lower *planaises;* Salers and Le Falgoux are examples of these old places. They are filled with charming memorials of the past, but they only come to life on fair-days. The outer circle marks the actual limit of the volcanic soils. There we find Saint Flour, Maunac and Aurillac, towns equally redolent of the past, but more wide-awake. Aurillac in particular, the centre of a basin eroded in the Tertiary clays, is the chief town of a district. The marvellous fertility of the soil has given rise to regular industries, such as flour-milling, and the preparation of macaroni paste and preserved fruits.

**Mont Dore, Yelay, Aubrac and Margeride.**—Besides the swarm of little brand-new volcanoes and its great volcano, which still preserves the simple magnificence of its structure despite the onslaughts of erosion, Auvergne has many other effects of vulcanism to show.

*Mont Dore* is a block comparable in size to Cantal, but more complex. Geologists have discovered in it a number of old emission-points, which account for the fact that the arrangement of the valleys and *planaises* is less obviously regular.

*Velay* consists of a series of tablelands extending to the Loire and the Allier, lava fields without any well-dehned slope and with steep craggy peaks rising from

them in places, a type resembling the Puy de Dome.

*Aubrac* is a lava field remarkable for its continuity. There is no trace of a cone or peak to indicate a vent, but the field rises nevertheless to altitudes as great as that of the Puy de Dome itself. The mode of life is that of the high *planazses* of Cantal. At so great an elevation villages or large farms inhabited throughout the year are of rare occurrence.

Volcanic deposits have always had an attraction for man by reason of the fertility of their soils. Those parts of the crystalline massif which the lava never covered are poorly endowed in comparison. Though *Margeride* lies no higher than Aubrac, it has nothing to show but dreary moorlands and thin pastures.

But the richest parts of Auvergne, or those at least that were the first to attract the presence of man, are the sunken basins in which the Tertiary beds have been preserved.

Limagne.—The two scarps that enclose Limagne on the east and west run in straight lines suggestive of fractures, and do in fact correspond closely to lines of fault But there are important details which go to show that erosion has played its part in emphasizing the relief. North and south of Clermont-Ferrand there are isolated hills standing out in front of the escarpment which reach much the same height as the tableland. Their clay-covered flanks are often crowned with a lava cornice, affording evidence of a flow which must have discharged itself over a surface now almost wholly lost.

*The Montagne de Ia Serre* is a sort of narrow spur detached from the edge of the crystalline tableland and standing out into the plain. Its rows of basalt columns

overhang slopes of clay covered with fields and orchards, and form a striking object to the view. The lava flow must have followed an ancient, almost imperceptible valley across a surface planed by the forces of erosion. At that time the Limagne depression was not in existence, but its place was occupied by Tertiary deposits partly covered with volcanic debris, which still remained *in situ*, though they had been swept off the higher parts of the crystalline bed-rock. The recent erosion-cycle, which re-excavated valleys in all directions, has been at work here also. The clays have been removed over wide surfaces, leaving only a few hills protected by their caps of basalt.

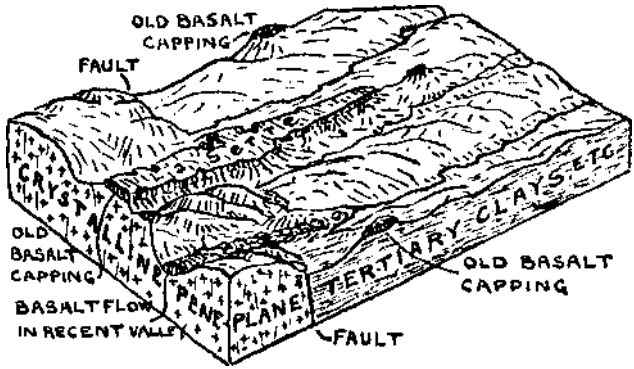


FIG. 13
BASALT-FLOWS OVER CLAYS

The fault that bounded the crystalline tableland was thus laid bare and rendered operative again by the simple fact that the rivers were forced to excavate narrow gorges in it. The lava-flows passing from the crystalline rock to the clays, like that of La Serre, stand out in the form of ridges in consequence of the weathering of the

underlying clay from the slopes which now surround them (Fig. 13).

We must not grudge the effort necessary to understand these complicated episodes in the local geology. They explain the whole geography of Limagne. The isolated hills which lend variety to the scenery offer many inducements to human occupation; the springs which break out at their foot or on their flanks; the defensive sites provided by their summits, which are often crowned by an ancient castle; the fertility of their slopes, which owe much to the fragments of basalt that fall on them and are easier to drain than the wet land of the bottoms; and the warmth of their southward face where the orchards and vineyards find a home.

The two escarpments that border Limagne carry a cordon of large villages of their own; marketing places where the mainly pastoral upland districts do business with the mainly agricultural plain, and sometimes more considerable towns where industries are supplementing trade. Thiers' reputation for cutlery is hundreds of years old, and Clermont-Ferrand is noted for its macaroni pastes, its preserved fruit and its leather, while the rubber industry and motor-car factories have invaded the outskirts of this capital of Auvergne.

The actual centre of Limagne is comparatively poor country. The low ground there is very wet and requires costly drainage, and the heavy, sticky soil makes hard work for the ploughman. For many years cereal crops followed one another in unbroken succession, but later beetroot was introduced, with chemical manures and artificial fodder-crops. Nowadays farms are hard to let, for the life is moving steadily towards the outer belt of the plain and the towns.

Limagne is the most extensive of the Tertiary basins of Auvergne, but there are smaller ones whose history would be still more complicated. There is the basin of Le Puy, for instance. The houses of the old town rise in tiers about the deeply venerated basilica, clinging to the volcanic crag, and near it stands that fantastic pinnacle which is crowned by Saint Michael's Chapel. In that region volcanic eruptions have buried the valleys on more than one occasion, but the Loire and its tributaries have re-excavated them.

Everywhere we find traces of that eruptive activity to which Auvergne owes her natural features. Violent earth-movements may be said to have let loose the volcanic forces, and erosion has not succeeded in destroying their effects.

This country, of widely divergent scenery, but difficult to penetrate, has developed a robust and active type of population, suggestive in some of its characteristics of the people of the South, though exhibiting the qualities we associate with Northerners or mountaineers. The native of Auvergne is a well-known figure in the streets of Paris, where he has settled for many years past as an artisan or small tradesman. He is shrewd and enterprising. From his own country he has contrived to extract practically everything that nature has made possible in the agricultural Une. Industrial development, aided by the available resources in the way of water power, has not yet reached its limits. Clermont-Ferrand is expanding every day and is destined to become the largest town of Central France.

# CHAPTER IX

## THE CAUSSES

WHETHER you reach Aquitaine by the line from Paris to Montauban, or Languedoc by the Clermont-Ferrand route, you cannot surmount the obstacle which the Central Massif presents to communication with the South without crossing the Causses. About Gourdon on the one line, or Millau on the other, the impoverishment of the vegetation and the disappearance of running water strike the most unobservant of travellers. The rocky, dry limestone soil is everywhere visible; the fields are strewn with great heaps of stones, to which the process of clearing the ground makes constant additions. We have left behind us the landscapes of the *Champagnes* or *Campagnes* of the Paris Basin to find a more rugged country suggestive of the South and its scorching sun. The air quivers in the summer noons above the super-heated soil and the step of the walker who ventures out upon the Causse raises clouds of grasshoppers.

The native requires neither geography nor geology *to* tell him exactly how far the Causses extend in this region, the limits he sets to them are the limits of the Jurassic limestone. All over the south-west, as far even as Languedoc, *causse* is a common noun denoting the limestone outcrops of every age; the Eocene limestone tableland of Castrais and the belts of Silurian limestone of the *Montagne Notre* are thus described with equal accuracy.

What strikes the native most forcibly is the dryness of the soil, for he is forced to look for water in the deep valleys to be found here and there, and to establish his homestead and his cultivated fields in the irregular hollows of the ground. The geographer associates with this type of landscape a whole series of peculiar features which are specially prominent in the Causses of the Central Massif and recall the limestone regions of Illyria known as the *Karst.*

We may mention in particular the enclosed hollows, which have the look of valleys that have ceased to function and are here called *sotches;* the funnel-shaped depressions, which in some places riddle the whole surface, and for which we have borrowed from the Karst districts the name *dohne:* the yawning chasms in the bottom of the *dolines,* or even sometimes on the surface of the plateaux, which are here called *avens,* but elsewhere *scialets, goules* or *emposteux;* and the caves that penetrate the steep sides of the valleys, which can be reached by way of the *avens.* In these last the investigator Martel discovered a complete subterranean system of torrents, lakes and waterfalls—all the water, in fact, which is missing from the surface.

We know that these features are due to the infiltration of the water along the fissures in the limestone, which it enlarges by dissolution. The normal erosion of valleys is replaced by a burrowing process, suggestive of the mole, which causes subsidences over larger or smaller areas with sides of varying steepness, and thus produces the typical forms of *avens, dohnes* or *sotches.* On the platforms of the Paris Region, where the limestone is not so thick and does not, moreover, stand so high, this process is less in evidence. The Causses of the Central

Massif rise to 1,300 feet, and the Jurassic strata of which they are composed sometimes extend to a depth which brings their base to the level of the sea. In Berry, on the outskirts of Limousin, the limestone is no more than a thin skin covering the edge of the planated Archaean Massif. The beds of limestone must have accumulated slowly in a calm bay of the Jurassic sea, and the earth movements of the Tertiary epoch incorporated them to some extent in the Central Massif.

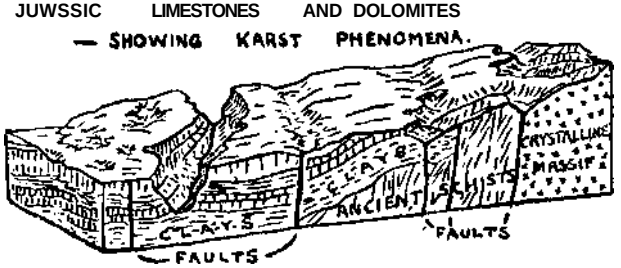


FIG. 14
FEATURES OF THE GAUSSES

Vertical fractures, or faults, often mark the line of contact between the limestone and the Archaean rock. Great cracks zigzag through the limestone beds themselves. In the gorges of the Tarn your eye may follow the cornice of a layer of dolomite to see it suddenly disappear and reappear again perhaps a thousand feet lower down. But no trace of these cataclysms is to be seen on the surface of the tableland. Faults that indicate the contact with the crystalline rock have themselves been smoothed over by erosion. The road from Meyrueis to Lanuejols crosses several of them, yet nothing in the landscape indicates their presence (Fig. 14). Thus the

dislocations which incorporated the Causses in the Central Massif have been effaced by the erosion-cycle which has smoothed out the region since that time. Vestiges of this stream-work are preserved in the granitic alluvium from Mount Aigoual, pockets of which are still to be found on the surface of the Causses. The Karst topography took shape when the valleys began their work of re-excavation in such regions as Limousin and Auvergne. Altitude accelerated the process* the water, vanishing from all parts of the surface, began its mole-like work of eating away the ancient peneplane from underneath. Only the main valleys were able to survive, and they did so by rapidly excavating their beds down to the impermeable strata, which he at so slight a depth that the subterranean water reappears in the valley trenches.

The extent of the Causses is determined by the dislocations which define the limestone outcrops. The geological map shows that the base of Archaean rock forms a promontory in the region of Rodez and Villefranche, dividing the Jurassic area into two. On the east the Causses are higher and wilder, these are the "Great Causses/' or Causses of Gevaudan. On the west their surface is 1,300 or 1,600 feet lower, these are the "Little Causses/' or Causses of Quercy, a more open and inviting country.

### THE GREAT CAUSSES

The surface of the Great Causses forms a kind of stony desert between 2,200 and 3,300 feet high Soil there is none, apart from the *sotches,* where the red clay resulting

from the dissolution of the limestone collects. The melting snows of winter often form pools in them, and every effort is made to conserve the water as late into summer as possible. The land yields a few crops under the plough, and stone walls endeavour to retain the soil on the sides. Here are to be found the only villages on the tableland. Everywhere else is naked rock bristling with excrescences and seamed with crevasses, or else a crazy pavement of angular fragments with a few tufts of grass or thorny bushes growing between them.

The relief of the tableland is by no means inconsiderable. Riddled with *dolines* and ploughed into shapeless hollows by the *sotches*, it is also crowned with knolls, from which there rise in places strange, ruin-like piles of dolomitic rocks. Sometimes a clump of stunted pine trees is to be seen on the horizon. Till you stand on the edge of them, you would never guess the existence of the great valleys that cut so deeply into the surface. There are only three: those of the Tarn, the Jonte and the Dourbie, each of them a gorge 1,600 or 2,200 feet deep. At the bottom the river winds between pebble banks of startling whiteness, or disappears into "narrows" between the vertical or overhanging walls of the massive limestone formations. The *canons* of Spain are scarcely on a grander scale.

Human life is not wholly absent from this wild country. It would even seem that early man sought the open tableland in preference to the inaccessible valleys and the wet granite country. The forest never spread over this region, and the plantations of pine which are making headway here and there are recent experiments. Botanists report the constituents of a steppe-flora on the tableland. The Great Causse is a

sheep country, and its scanty but sweet grass imparts a particular flavour to the ewes' milk from which *Roquefort* cheese is made. This famous product owes much to the limestone caves, in which it is kept at a constant temperature while it matures. 520,000 sheep graze on the steppe-land of the Causses, yielding nearly 10,000,000 gallons of milk and 7,000 tons of cheese of the value of 30,000,000 francs.

A population is also to be found clinging like barnacles to the bottom of the narrow valley-trenches. The advantages of the climate have there outweighed the difficulties of communication. For centuries the products of the soil were brought down the Tarn on rafts; the path climbed many hundreds of feet above the river to pass the narrows, and the latter were often guarded by a castle. The depth and the very narrowness of the valley make it an ante-chamber of the South. The sun, reflected by the limestone walls, bathes the side exposed to its noonday rays, and wherever a little earth can be retained on the slopes and a channel of water led to it, enables the choicest crops to be grown. Grapes and all the southern fruits, including figs and almonds, ripen in the little gardens raised tier upon tier; maize will tnrow up shoots six feet or more in height.

Little villages lie scattered along the Jonte and the Dourbie, but as we approach the outskirts of the Causses the valleys gradually broaden; cultivation begins to spread to the lower slopes, which here consist of Liassic marl, and big villages appear half-way up the valley side, where the spring-line comes. In this region the market centres have grown into small towns. Millau spins the wool of the Causse sheep, tans their skins and manufactures gloves

### THE LITTLE CAUSSES

Human life, for all that, has its limitations in the Great Causses of Gevaudan; in the Little Causses of Quercy it has made itself more at home.

Here we find no lofty expanses cut by deep gorges, but tablelands not more than 1,600 feet high. The rock still breaks the surface everywhere about us, but there is enough red earth between the white patches of rough ground for a scattering of bush-oaks that veil the nakedness of the soil. Here and there a slope has been laboriously cleared of stones for cultivation. *Avens* and *dolines* still pit the surface of the arid tableland, but the great enclosed depressions are replaced by a regular network of valleys lacking nothing but running water. Obviously they owe their existence to the slight depth at which the subterranean water occurs. They form lines of verdure across the arid tableland, with arable fields climbing up the slopes and meadowland in the bottom, which is sometimes flooded after heavy rain and often veiled in mists on autumn mornings.

The main valleys have ceased to be deep and narrow gorges. The Dordogne and the Lot describe wide meanders, whose concave banks touch the cliffs on either side in turn across a mile or more of valley. On the convex banks alluvial terraces rise one above the other. Under a sky now definitely southern the land brings cereals and fruits to maturity, conveying a sense of abundance and wealth that heralds the approach of the favoured soils of Aquitaine. Here the contrast between the Causse and the poorer granite region is particularly strong. On the latter, the *Segala,* the cereal crop is rye,

while wheat is at its best on the limestone.

Early man took up his abode in the valleys, where game and fish and natural shelters were plentiful. In the caves and rock-shelters of the valley of the Vezere, at Les Eyzies and Laugerie Basse, the bones of primitive men have been discovered of an aspect still almost simian. Drawings of reindeer and mammoths have been brought to light, and finely worked implements of bone, revealing an artistic sense astonishing in human beings who were contemporary with the great glaciers.

The population to-day is still concentrated in the valleys, much as it must have been in the Gallo-Roman period. Though it developed at so early a date, this region has made little or no progress. Its interests are purely agricultural, its horizon limited. The villages built in lines along the terraces of the Lot and the Dordogne, the little townships that grew up at the easiest river-crossings, have never changed. Cahors with its historic bridge and its old church is the only place that possesses any industry depending on the products of the soil. It has tanneries and flour-mills, makes macaroni pastes and cans vegetables.

The Causses will always be a region of great interest to the geographer, but the economist will prefer to turn his attention to districts with a greater future before them.

# CHAPTER X

## THE CEVENNES

SOME atlases print the name Cevennes all along the eastern edge of the Central Massif, but locally its use is traditionally confined to the mountains that stand out against the north-western skyline as one surveys the panorama visible from the Tour Magne at Nimes, or from the Peyrou terrace at Montpellier.

Their profile reminds us of the Vosges. The blue line that seems to float above the beaches of the Mediterranean coast shows only by the gentlest of rises where the summit of Mount Aigoual lies, though it is 5,141 feet high, or the topmost peak of the Lozere mountains, which is 5,581 feet. Before we reach the foot of the range, we must cross 25 or 30 miles of open plains covered with vineyards or *garrigues* scorched by the sun, where dwarf kermes oaks splash the broken limestone with patches of dark green, and olives encircle with their silver sheen the villages nestling in folds of the ground. Rocky crests rise here and there. The peak of Saint Loup lifts its scarps so proudly to a height of 2,077 feet that it was long reckoned the highest point in Languedoc. The nearer we get to the Cevennes, the more completely this curtain of minor ranges and limestone tablelands conceals them. As we pass out of the gorges of the Herault, it is startling to see the horizon blocked by the mass of Mount Aigoual, which seems to be crushing the little town of Le Vigan. Similarly at

Alais or Besseges the effect is that of a mountain starting suddenly from the ground. Narrow crests and deep, steep-sided valleys meet the eye on every side. Neither road nor railway can climb the gradients without constant resort to zigzags, bridges and tunnels.

For the denizen of the Mediterranean plains the climb unfolds scenery in all respects novel. The vine soon disappears, and every slope is fleecy with the green foliage of the chestnut, broken by patches of grassland in the neighbourhood of the villages. The mountain effect grows still more marked as the chestnuts themselves yield place to clumps of beech or open moorland. But we have left the valley bottoms far behind; the road has reached a ridge, broader and less broken than might have been supposed. We see the highest summits in a new aspect. They are rounded brows of heavy form overtopping a rolling tableland, in which the valleys that were yawning abysses lower down fade away entirely. We know this landscape: it is that of Upper Limousin. Clearly the mountain range is in this case nothing but the edge of the crystalline massif cut up into ridges by erosion. The arrangement of the vegetation in successive zones is the result of this process, and is rendered the more striking by the fact that the mountain front faces the Mediterranean.

Wherever we find these geographical features repeated we are justified in using the name Cevennes, but no further. Piivas is, roughly speaking, the northern limit, and southwards the Espinouse mountains retain the characteristics of the Cevennes as far as the neighbourhood of Saint Pons.

Few natural regions are so well worth systematic study. The geographer will find that the details of the

landscape, and even the occupations of the inhabitants, result from the evolution of the relief.

## EROSION SCULPTURE

From the summits that constitute the watershed, in clear weather you may see the sand bar of a lagoon in Languedoc glittering in the distance, with the waves of the Mediterranean breaking on it. The sea is almost at your feet, and this contiguity explains the savage erosion effected by the torrents that rush down the steep front of the Cevennes. The same view embraces the dizzy gorges of the Gard or the Gardon and the waters of the Tarn or the Lot gathering in broad glens for their long journey to the Atlantic. On one side the mature forms resulting from ancient cycles of erosion, still visible on the uplands thanks to their distance from the sea; on the other, the forms of youth sculptured by forces of erosion intensified by the shortness of the fall to base level The torrents of the Mediterranean slope are visibly deepening and lengthening their beds as they eat headways into the face of the mountains. We can watch the ravines gaming more and more territory from the bare uplands; near the village of l'Esperou a fan of runnels has appeared, carrying into the Plerault the rain that drained, some thirty years ago, into the basin of the Tarn.

It is easy to see how the ridges have been formed which are known locally as *Serves* Any viewpoint will show them standing out from the rolling platform which represents the earlier relief At first they resemble a broad roadway, but they grow steadily narrower, while the

valleys deepen and broaden at their expense. Some have a regular eastward drop, and their profile seems to indicate the sharp dip of the edge of the ancient massif towards the Mediterranean as it was before erosion began.

It is only at the base of this glacis-like face that geologists report serious fractures like the faulting on the eastern edge of the Vosges. These dislocations were accompanied by volcanic eruptions, of which the traces would be more in evidence but for the violent erosion which has been in operation on these slopes. The lava-flows which spread down the valleys now cap the heights. Thus blackish escarpments are to be seen on the ridges of the Escandorgue mountains. Between Privas and Aubenas the long basalt tablelands of the *Coirons* stretch down to the Rhone opposite Montelimar. Their lofty surfaces recall the *planaises* of Auvergne, with their edges scalloped by ravines and dissected into spurs and relict hills, and their villages, embowered in almond trees, nestling on the spring-line. Sometimes they are almost overshadowed by the cornice of black rocks, from which great blocks detach themselves and fall from time to time.

Everywhere else the ridges of the *Serves*, like the bottoms of the torrent beds, reveal the rocks of the Archaean massif. The ravines are narrower and more frequent in the schists; the granite and the gneiss have suffered only minor deformations. But the most notable difference is that which generally manifests itself between the upstream and the lower portions of the valleys. Near the spring head the profile is simple; the sides fall steeply but regularly. Near the point of entrance to the plain the features become more complicated; the descent from the *Serres* is effected by a series of steps. Before you

reach it, you are scarcely aware of the gorge down which the water leaps from boulder to boulder after rain, for it is sunk in a hummocky surface, which seems from above to be the actual bottom of the valley and certainly must have been at one time. The excavation of the valleys on the Mediterranean side proceeded by several stages. The flatter parts of the slopes correspond to the successive valley sections, and on these it is possible, with the aid of irrigation, to grow permanent grass. A few arable fields even contrive to maintain their hold, and most of the mountain hamlets are perched on these ledges. But where the steep slopes afford no such foothold streams of stones descend from the top of the *Serves* to the chestnut woods.

We have then these great facts, to which all the natural features of the Cevennes may be attributed: the sudden lowering of the edge of the Central Massif where it approaches the Mediterranean; the victorious attack of the forces of erosion from the Mediterranean side and their capture of increasing areas of the Atlantic drainage; the consequent dissection of the face of the massif into *Serres*, and the unremitting excavation of the valleys. The drop of 3,000 or 5,000 feet between the brow of the Cevennes and the Mediterranean plain determines the different zones of vegetation, though their extent is increased by the ramifications of the valleys. Occupational zones as clearly marked as those of the Alps correspond to the zones of vegetation.

### ZONES OF ALTITUDE IN THE CEVENNES

Mediterranean ways of life penetrate into the heart of

the mountains along the main valleys At the very foot of Mount Aigoual, the glaucous green of the olive alternates with the bright green of the mulberry, and there are acres of gnarled vine stocks cut close to the ground. Little fields of wheat stretch in narrow strips between the dry stone walls that retain the earth on the steep slopes, and the water runs in channels bringing verdure in its train. The tall houses climb the slope in close company, making a cool shade for the narrow village street with the church at one end of it. All these details, which strike the visitor so forcibly, are the product of long centuries of labour and patient adaptation They are not peculiar to this region, most parts of Provence especially will show the like.

The really characteristic zone of the Cevennes is the zone of the chestnut plantations, which wind like a green ribbon through all the valleys. The tree is at its best between 1,300 and 2,600 feet, but it was often planted higher between dry stone walls that have now fallen into decay. A string of villages he along this zone. Seen from a distance they make a white patch in the green cloak of chestnuts, generally ensconced in a tributary valley, or *cale,* or else on the edge of one of the benches that break the slope of the valley-sides. The houses mount one above the other; the highest are often falling into ruins. The long winters and the hard mountain life do not suit the younger generation nowadays, since they have got to know the plain and its towns. But for hundreds of years men have lived here, contenting themselves with chestnut porridge and goats' cheese. Living isolated in the depths of their *cales,* the mountaineers of the Cevennes have jealously kept the Protestant faith, which was brought them by their ministers at the time

of the Reformation, and in the days of the "Camisards" they rose in its defence, as the Breton Chouans fought for the king.

Higher up, where the clouds driven before the sea breeze, the *marin,* from Lower Languedoc, hang persistently for whole days at a time, the chestnut ceases. Formerly the beech must have covered these slopes, and there are still fine forests of it here and there. But the axe has laid it low to make room for more chestnuts, often neglected afterwards, or to extend the upland pastures; the nibbling of sheep and goats has prevented the beech from taking fresh hold, the heavy rains have washed away the soil, and streams of stones now streak the slopes. To find an almost unbroken covering of grass we must climb to the tops, which erosion from the seaward side has left untouched. The highest summits, like Aigoual and Mount Lozere, possess vestiges of an Alpine flora, showing, according to the botanists, the absence of forest even before the intervention of man.

A few scattered villages lurk in the hollows of these uplands at heights between 3,000 and 4,000 feet. These are communities of herdsmen obstinately devoted to their calling and regarding trees as their enemies. The Forestry Department has had to resort to ruses and persuasion to induce them to tolerate its experiments *in* reafforestation, which have proved eminently successful on Aigoual. But cattle are raiely seen on the uplands of the Cevennes. The grassy slopes are trodden down by sheep, large flocks of which are driven up from the plain when the snow melts and the green grass springs up to replace it. The routes they have followed for centuries are traceable from a distance by the white ribbon they make upon the mountain-side. These

*drailles* are one of the characteristic features of the landscape in the Cevennes. They serve to mark a certain unity of interest between the pastoral uplands and the plain.

Such are the zones you find from end to end of the Cevennes, from Saint Pons to Privas. The lowest zone, with its Mediterranean characteristics, has always been the richest and continues to be so in an ever greater degree. The inhabitants tend to concentrate in it, abandoning the chestnut plantations and the pastoral uplands, for they are attracted to it not merely by the variety of its agricultural resources, but by the town life.

At the mouth of every valley a market centre has grown up and in some cases a fortified town. Industry found a foothold in early days in the little towns like Le Vigan, which was famous for the manufacture of silk stockings in the eighteenth century. At Alais the presence of coal has caused the setting up of blast furnaces, and the chimneys belch their smoke over the valley of the Gardon as far upstream as La Grand* Combe.

The particularist attitude of the inhabitants of the separate valleys tends to disappear as those valleys become more deserted. The Cevennes have never formed a single political unit, and to-day they are further than ever from doing so. But they remain one of the most strongly characterised natural regions of France and one of the most instructive for the student of geography.

# CHAPTER XI

## THE JURA

As SOON as the main elements in the relief of France came to be understood, geographers were impressed by the distinctive character of the Jura. There can be no question as to where it begins or where it ends. It lies between the plain of the Saone and the hill country of Switzerland in a kind of crescent narrowing at either extremity. Its southern tip meets the Alps; its northern tip rests on the Black Forest. In length it is about 150 miles, and its greatest breadth is 30 miles.

Its summits are higher than those of the Vosges, though they do not rival the highest peaks of the Central Massif. (The Cret de Ia Neige is 5,658 feet high.) Nevertheless, it is a younger range and more similar in build to the Alps.

## THE RELIEF OF THE JURA

If we take a map which shows the region in sufficient detail, we are immediately struck by the regular arrangement of ridge and valley stretching in long lines parallel to the curve of the crescent. The river-system of the Doubs and its tributaries, like that of the Ain, consists of a series of longitudinal watercourses connected by short transverse branches. Once geologists began to turn their attention to the phenomena of earth-movements,

the Jura was recognised as a folded region whose relief conformed absolutely to the regular rise and fall of the strata. Nearly a hundred years ago Thurmann described the vaulted uplifts that occur in the calcareous formations, to which the name of *anticlines* has since been given, pointing out that they correspond to the ridges of the Jura, while the intervening trough-like depressions, now called *synclines*, represent the longitudinal valleys.

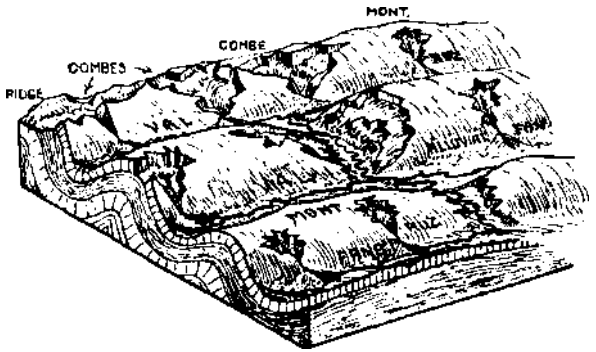


FIG. 15
JURA-FOLD TOPOGRAPHY

All the features in the topography of the Jura are seen on examination to be the direct or indirect consequences of the geological structure as the controlling factor in the process of erosion. The names they bear in the popular speech are an indication that they influence in no small degree the lives of the inhabitants (Fig. 15).

The Jura has given its name to a French department; it has also provided a name for a geological period. The *Jurassic* rocks, and particularly the limestones of that

series, constitute practically all the ranges of the group. The more recent Cretaceous beds are only to be found in the bottom of the synclines, where, along with the Tertiaries, they have escaped erosion. The anticlinal ridges of the Jurassic form the *monts,* the lofty, massive shoulders stretching in a continuous line along the horizon. The forest covers the dry limestone slopes worn at intervals into narrow, slight ravines by little torrents called *ruzes.* The various water-courses unite in the bottom of the synclinal troughs, where the Cretaceous beds and clayey sandstone of the Tertiary "molasse" prevent absorption. This is the *val,* the valley proper, where nothing that can attract human settlement is wanting.

After following a *val* for what may be a long, or only a short, distance, the river must quit it in obedience to the call of the plains and pass into some lower *val.* The *cluse* which affords it passage is just as confined and wild in appearance as the *val* is open and inviting. The steep walls with their limestone scarps rising clear of the forest, the sunken stream-bed where the water leaps from rock to rock—the whole scene bears witness to the unabated activity of the forces of erosion in the region. The road is often hard put to it to find a passage along the *cluse,* and human settlements give it a wide berth.

But this is not the only topographical feature that tells of a transformation in the original relief as the folding left it. The *monts* rarely attain the elevation which the inclination of the limestone flanks of the anticline would lead one to expect, and the broad pastures that he above the forest line suggest some increase in humidity. Springs often appear in hollows in the

summits. A layer of limestone once covered the *mont* that rises so majestically above its neighbouring *val.* In process of time that covering was worn away, and older beds of clay or marl have been exposed, as the geologists now tell us. Thurmann in his day supposed that the top of the fold had broken away, but for us it is a clear case of erosion. One or more *ruzes,* eating headwards until they reach the top of the anticline, are capable, once they have excavated down to the softer stratum, of extending the area of their valleys. The limestone will form a cornice continually undermined by the slipping of the clays, and so it will gradually retreat. In fact we often find two cornices facing each other at the top of the Jura ranges with a sort of hollow between them overhanging the neighbouring *val.* Such depressions are called *combes,* and frequently have a hamlet nestling in them. The cornices are the *crets,* which form the highest points in the Jura; the Cret de Ia Neige, the Cret du Nu, and the Cret d'Eau (corrupted into *Credo).*

*Mont, val, cluse, ruz, cret* and *combe*—in these names we have the whole topography of the upper Jura as its own people see it. As the products of the local structure modified by erosion these phenomena have become classical, and geographers in every country look to the Jura for types of the simplest forms of fold-mountains (Fig. 15, p. 114).

In point of fact, you will not find them developed to the same extent throughout the whole region. As you cross the mountains by the line from Dijon to Lausanne, you will probably be surprised to see nothing west of Pontarlier but waterless tablelands dissected by a few gorges that remind you of the Causses. A moderately

large-scale map of the Jura will, in fact, show a belt of tablelands to the west and a belt of ridges to the east. The tablelands consist chiefly of Jurassic limestone only slightly folded; the ridges correspond to compacter folds lying like a piece of rumpled cloth high above the lakes of Switzerland.

The two belts are not developed equally throughout their length. Their altitude varies, and with it the ease of communication in a transverse direction. It is not difficult to understand why the Jura never formed a political unit. The frontier between France and Switzerland cuts it obliquely without regard to any physical feature.

The contrasts that manifest themselves on the French side of the line suggest a threefold division of the country into a Southern Jura, containing Bugey; a central Jura nearly corresponding to the ancient province of Franche-Comte, and a Northern Jura, of which the Montbeliard district formed at one time the centre.

## CENTRAL JURA

The Jura is broadest in its middle section, and there the tablelands and the ridges come nearest to attaining equal development.

The tablelands look down on the plain of the Sadne over a scarp from 650 to 1,300 feet high: their even skyline limits the eastward view from Bresse. The road from Bourg to Besan^on runs for over 90 miles at the foot of the scarp. Sometimes it is seen as a continuous ridge, like the Re Vermont; sometimes scalloped by ravines that carve it into amphitheatres, such as the "Vineyard"

of Lons-le-Saunier; and sometimes even dissected into isolated hills by the erosive action of the Doubs, whose winding course hugs the very edge of the tableland in the neighbourhood of Besancon. Various advantages have attracted men to this region of broken relief the opportunities for defence offered by the scarped spurs, the favourable exposure of the flanks that face the sun, the springs issuing from the base of the limestone cornices, the fertility of the slopes of Liassic marl, and the presence of the salt enclosed in the beds of the Inas The names of Sahns and Lons-le-Saunier remind us of the importance of the salt trade m earlier days, as the occurrence of "Vineyard" bears witness to the prosperity the district owes to viticulture, though the ravages of the phylloxera have in many places caused the substitution of orchards or arable fields for vines. The population is extremely dense, between the 600-foot and the I,ooo-foot contours there are 518 persons to the square mile, and between 1,000 and 1,300 feet, 28s; Village churches, lying usually half-way up the slopes, are frequent and conspicuous features of the landscape.

Three or four large villages serving as markets for the interchange of wares between the plain and the mountains, or perhaps as citadels to guard the ioad up to the table-lands, have become towns The most impoitant is Besancon, thanks to its traffic with Northern Jura, on whose outskirts it lies The old citadel, built on the narrow neck of a steeply-walled meander, dominates the town, which spreads down to the river The town is the local capital of the watchmaking industry, which has a special school there and a regular scientific administration.

Nothing in the ever-varying topography of this region

would lead you to suspect the existence of the level tablelands that open out as you climb up from Besangon or Lons-le-Saunier. Irregular dips, stony eminences, swampy basins and chasms like the *avens* of the Causses, here called *emposieux,* give a distinctive character to the landscape. Water-courses vanish. The Loue rises in a seething cauldron at the bottom of a magnificent gorge. When the absmthe factory at Pontarlier caught fire, the green liquor found its way into the subterranean torrent-system and imparted its odour to the springs.

The tablelands are 1,600 to 2,600 feet high. They rise by a series of pitches separated by terraces or rounded upfolds usually carrying woodland. The extremes of the climate intensify the aridity of the soil: the snow lies long, and the summers are scorching. Man would scarcely have been able to make his home there but for two countervailing advantages. Local dislocations of the structure rendered it possible here and there for erosion to lay bare the underlying marls; and again, the Alpme glaciers were extensive enough, during a portion of the Pleistocene period, to override the ridges of the upper Jura and so reach the tablelands, in parts of which they left thick deposits of morainic material.

The excessive humidity of some of the basins is due to the boulder clay, and the distribution of meadow-lands and arable fields depends upon it. But still the tablelands are comparatively uninhabited. They carry a population of 52 to the square mile, or little more, and contain only a single town, Pontarlier, which has grown up at the mouth of one of the bigger *cluses,* where the tablelands and the ridges meet.

The transition from the tablelands to the folded Jura is marked by a greater exuberance in the vegetation.

Woods become more frequent, the spruce displaces the beech, the meadowland grows more extensive, and its lighter green alternating with the sombre masses of conifers makes up the landscape called the *prd-bois,* or "grass-and-timber country."

The course of the frontier leaves the greater part of the high ranges in Swiss territory. Only south of Pontarlier, in the Saint Claude region, can we take our stand on the last eminences of the Jura and gaze on the blue expanse of Lake Geneva with the jagged peaks of the Alps behind it. Only then can we realise the full quality of the life among these mountains. Between the sombre flanks of the forest-clad *wonts,* the *vals* are streams of vivid greenery. The tall houses of the villages have begun to look like Alpine chalets, and stand in rows with their broad roofs projecting over the wooden balconies. Comfort reigns in the *vals,* and the population of the upper Jura is two or three times as dense as that of the tablelands, for all their lower elevation and greater warmth. Stock-raising and forestry are supplemented by a variety of small domestic industries, which serve to beguile the leisure enforced by the long winters. Watchmaking, the stand-by of the Swiss valleys, is gaining ground, but not ousting the older manufacture of articles in horn and bone. There is water power in abundance to turn the lathes and give light to the villages.

## NORTHERN JURA

In the north of the Jura the course of the frontier leaves only the tablelands to France. An isolated chain,

however, called the Lomont, crosses them from east to west. Whether you approach from the north or the south, the straight skyline of the ridge runs apparently unbroken and gives no hint, until you are close upon it, of the narrow *cluse* of the Doubs, nor yet of the farms that nestle in the *combes* eroded *in* the summits of the folds above the steep forest-clad flanks.

South of the Lomont the tableland is higher, drier and less inhabited, but to the north, as it falls towards the Belfort Gap, the presence of humanity is more evident. Where remains of Tertiary beds afford a more favourable soil, wide expanses of the surface are under the plough. The villages find water at a slight depth in the hollows, which are sometimes distinctly wet on the surface.

Here Montbeliard was in past times the centre of a region that long retained its independence beside one of the main thoroughfares of Europe. Weaving was an old-established trade in the country districts; little iron works, with the assistance of the woods, turned the Jurassic ores to good account. Watchmaking made considerable progress in the nineteenth century, and after 1871 the emigration of Alsatians and Alsatian capital fostered the growth of large-scale industry. Spinmng-mills and foundries now disfigure the country down to Besaneon and Belfort.

## SOUTHERN JURA

The southern end of the Jura belongs entirely to France. The relief is here more broken, the contrasts between upland and valley more distinct, than in any

other part. As the traveller steps out on to the platform at Culoz, the junction for Geneva, Lyons, Chambery and Grenoble, he sees the Grand Colombier lifting its forest-draped limestone scarps 4,000 feet above the valley, and in that valley, the fairest of its kind, vineyards and orchards that transport him to the sunny south.

There is no dividing this region into tablelands and ridges. Intense folding has affected the whole mountain mass, reducing its breadth but increasing its average height. From a high summit of the Pre-alps—Parmelan, Bargy or Mole, the dark blue ridges of the Jura may be seen at sunset against the resplendent golden glory of the horizon. They appear as a series of bars extending in straight lines. The nearest ends suddenly on the south, but its place is taken by another bar behind, which vanishes in turn to reveal yet another. Accidents of the folding have produced this arrangement, which suggests the wings of a theatre, and the Rhone has taken advantage of them to work its way to the west. If one thinks of the vicissitudes the region has undergone since the glaciers reached their greatest extension, of the advances and retreats of the glacial front with their alternations of deposition and erosion, it is not surprising that the great river should have altered its course several times over and should still be seeking in some parts of its course the best position for its bed. Thus it pierces the ridge of the Cret d'Eau in a magnificent *cluse* guarded by ancient forts clinging picturesquely to the escarpments, loses itself for a moment in a limestone fissure at Bellegarde, and nearly disappears in an inaccessible gorge on its way to Seyssel. The railway from Amberieu to Culoz follows a dry valley sunk deep between high limestone walls, where falls of

rock are frequent; it may be that the waters of the Alps once passed this way

All the Southern Jura bears the impress of the great glaciation Between the ridges he narrow bands of limestone tab Wand at elevations of 2,000 to 2,(>oo feet, and the presence of water tliere is due to the moraines and the clay which they contain in larger or smaller amounts. The cultivation, the meadows, the upland villages, are ail assoi lated with the moraines, and a veneer of morainic material is often responsible for the freshness of the *combes* laid open by erosion on the flanks or the summit of the anticlines The presence of the chestnut and plants that flourish on siliceous soils is explained when we see the tilth strewn with quartz pebbles from the Alps Wheie the morainic covering is lacking or has been swept away, the water vanishes into the naked limestone, and *avens* and *dohnes* riddle the ground The forest hides this onslaught of the forces of erosion except on the sides ot the *duses,* where the scarps may rise as much as a thousand feet sheer

In the Southern Jura there is a life of the uplands and a life of the valleys as distinct from one another as their scenery and their climate. If the former is harder (and the snow lies there for several months of the year), it is none the less beloved of the inhabitants, for the mountains afford means of livelihood in ample variety. So high are the returns yielded by the forests that in some districts strangers may not settle. Stock-raising finds profitable outlets in the adjoining industrial towns.

The hfe of the valleys takes on the characteristics of Dauphiny A blazing sun ripens the grapes that yield Seyssel a celebrated wine For hundreds of years their apples have come down the Rhone on rafts that are

broken up and sold at Lyons. The basins of Belley and Saint Genix were always accounted a fortunate land; its fruit and vegetables and succulent chickens provided the guest of even the humblest of its inns with a repast of which no palate could complain.

The densest population in the Jura is to be found in these valleys. With agriculture and trade is combined a certain amount of manufacture. Even in the Cluse des Hopitaux factory chimneys stand at the foot of the limestone cliffs, for the silk industry of Lyons is spreading this way. At Bellegarde the water-power derived from the Rhone and the Valserine has given life to a regular city of the latest type, which supplements the deficiencies of the local labour supply by recruiting its workpeople as far afield as Italy. In this connection a curious detail is worth mentioning. As the flow of the Alpine stream diminishes in winter, the workmen return to their homes. They come back again when the Rhone is swollen by the melting of the snows, and the turbines are running at full capacity. The power developed at this season is known as "summer horse-power" *(les chevaux d'iti).*

Although it includes the highest peaks, the Southern Jura is not an obstacle to communications, thanks to the gaps made by its *cluses.* The little towns of Nantua and Amb6rieu guard the entrances to two routes through the mountains in the direction of Geneva. The Amberieu route via the Cluse des Hopitaux, though the longer of the two, is the one taken by the railway, which forks at Culoz for the Alpine route and the Mont Cenis tunnel.

The Central Jura is a broader and more massive barrier. No *cluse* crosses its whole width. It was only in the early years of the nineteenth century that the

engineers resolved to tackle the problem of a tunnel under the high limestone ridges which would avoid the windings and heavy gradients of the line from Pontariier and give direct communication with the Simplon route across the Alps. When we take into account the two borings made in the Swiss part of the Northern Jura, it must be admitted that the barrier set up by structural folds across the routes from Western Europe to the Eastern Mediterranean is no longer an obstacle to rapid communication.

# CHAPTER XII

## THE ALPS OF SAVOY AND DAUPHINY

### THE ALPINE FORELAND

ALL South-western France is dominated by the Alps. The swift waters of the Rhone come from their peaks. Its Alpine tributaries, the Arve, the Isere, the Drome and the Durance, are more potent to affect the appearance of the great river, swollen as it is with the melting of the snows till summer is well advanced, than the placid Saone and the impetuous torrents of the Cevennes As we follow the high road to the south down the Rhone valley, the western hoiizon is limited all the way by the monotonous heights of the Central Massif. But to the east the prospect alternates. At one moment the eye is free to roam over a stony plain strewn with the debris deposited by an Alpine stream as it reaches base-level, at another the view is closed by some mighty bastion of the mountains. In spring, when the plain of Provence is bathed in light and warmth, the peak of Mont Ventoux, still white with snow, is the most conspicuous object in the landscape. At Valence the almond is in flower when only a few miles away the tableland of Vercors is still deep in snow. Even at Lyons the dwellers in the high districts of Fourviere and Croix-Rousse can see the peaks of Belledonne glittering, apparently close at hand, while the winter fogs are hanging over the Rhone below them.

**The site of Lyons.—**The great city of the Rhone and the district round about it bear in their natural features the imprint of the vast ice-cap that covered the region in Pleistocene times, when the glaciers overflowed the valleys of the Alps and deposited those enormous boulders on the slopes of Croix-Rousse. Several of these have been preserved at a street corner as natural curiosities (Fig. 16).

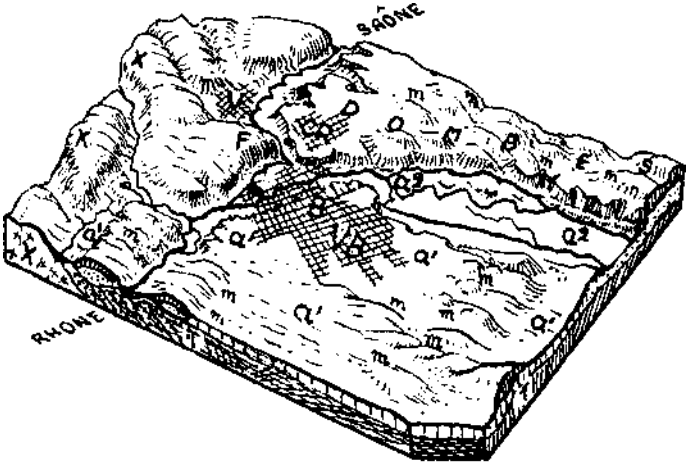


FIG. 16
THE SITE OF LYONS
X, Archaean crystalline rock
T, Tertiaries; mm, moraines
al, fluvioglacial gravels $a^2$, recent alluvium
V, Vaise F, Fourviere CR, Croix Rousse
B, Fes Brotteaux VB, Villeurbanne

Few town sites appear to be so obviously indicated by nature as that of the Gaulish metropolis. It lies at the confluence of the Rhone and the Saone, where both

streams are narrow and easy to cross, and on the borders of the Central Massif, against which they have been forced by the masses of alluvium brought down from the Alps. The constriction of the Saone between Croix-Rousse and Fourviere is due to an episode in the shifting fortunes of the glacial front. The plateau of Dombes, over which the market gardens of the north-eastern suburbs are gradually spreading, represents more or less the surface over which the Rhone and the Saone once flowed. It is now thinly covered with boulder clay, in the hollows of which the water naturally tends to collect, and these have given rise to numerous ponds abounding in fish. The plain east of the Rhone, over which the new town is steadily extending—the Brotteaux district and the industrial suburb of Villeurbanne—was the theatre in which the most striking incidents of the glacial contest were enacted. According as the ice advanced or retreated, and deposition or denudation for the moment predominated, little hills were formed by the accumulation of morainic material, and banks of pebbles with regularly trimmed slopes were laid down by the torrents, or else the violent erosion of the Rhone undercut the foot of the Dombe and swept enormous masses away.

**Lower Dauphiny.**—Two hours in the train will transport a man from his home in Lyons to the actual foot of the nearest Alps, and he will travel the whole distance through a region built entirely out of Alpine detritus. The country is a mass of small stones. You see them in every cutting, in the foundations of the houses, which are often made of rammed earth above, in the walls of the churches and even in their towers. The relief, which grows increasingly prominent as Lyons

recedes into the distance, is the very picture of confusion. It becomes intelligible only when we remember the strange landscape of ice, torrents and moraines that existed when our ancestors were carving reindeer bones in the caves of the Lot and the Dordogne. These swampy hollows, sometimes occupied by lakes, are the basins in which some lobe of the glacier front maintained itself for ages; the wooded elevations curving round them are the moraines that accumulated on its edge. These stony flats show where the mighty torrents escaping from the melting ice spread themselves abroad. Those flat-topped heights represent ancient terraces dissected by erosion. They were the deposits of torrents that ran in a yet more distant past, when the glaciers were only beginning to invade the Alps and the valleys had not been excavated to their present depth. The limestone and granite fragments have disintegrated on their surface to a clay strewn with quartz pebbles, and formed the niggardly soil which earns for these uplands their reputation for coldness.

With these facts in mind the traveller will find much to interest him in the diversities of this Alpine foreland. It constitutes the heart of the old province of Dauphiny, though that extended also into the actual mountains. He will be ready to admire the good use that has been made of the soil. The forests that cover the heights of the "Cold Lands" have been left undisturbed; the dry, stony plains have been turned to arable farms, as typically in Bievre; the wet basins have been changed into meadowlands; the villages cluster at the foot of the slopes, where the springs break out. Irregularities in the fall of the streams have been utilised to provide power for corn or saw-mills, lathes or other machinery,

and an early start was made with an industrial development which is continually growing.

Lower Dauphiny has always been noted for the enterprise of its small towns, either as agricultural markets or as local trading-centres in a region where easy circumstances are a tradition of the countryside. The cloth of Voiron and the paper of Rives have been famous for hundreds of years. At the present day more and more factories are being built in the valley of the Fure. Besides paper-mills there are foundries and engineering shops, but the looms that work for the Lyons trade are more important still

## THE PRE-ALPS

As you leave Rives by the Grenoble road you realise quite suddenly that the Alps are close at hand. In the plain of the Isere, which opens at your feet, you may recognise one of those basins in which the front of the glacier once came to a halt, but the spectacle of the imposing masses of Vercors and the Grande Chartreuse, with the serrated peaks of Belledonne visible between them through the Voreppe gap, is something entirely new. The grand limestone scarps may remind you of the Causses, but here you see the enormous beds that form them rising on the flanks of the mountain to its summit and coming down again on the other side to the level of the valley. Here you have a region folded like the Jura, but it is all on a grander scale, and the structure is more complicated.

There is a bench on the mountain-side above Sassenage from which you can look out over the valley of the Isere on to the Massif of the Grande Chartreuse. The only

systematic feature to be observed is a tendency of the ridges to run parallel to one another. The rest is a chaos of little green valleys and narrow *cluses,* of almost flat-topped eminences and knife-edge ar£tes, of pointed crests and pyramids.

You will learn to your surprise that the peak of Chamechaude is really the bottom of a syncline, as is also the Alpette range that overhangs the Gresivaudan. Think of the stupendous amount of dislocation these rocks have undergone, and the astounding effects of erosion that have been the consequence!

It is the same all along the front of the Alps. The Pre-Alps are limestone ranges folded like the Jura, but more violently, and they continue through Savoy as far as the Lake of Geneva. The abundance of running water, the vigour of the forest growth that covers the mountain sides, and the beauty of the meadowlands that carpet the valleys, show that lime is not the only constituent of the underlying rocks. Layers of marl or clay are intercalated between the beds of Jurassic or Cretaceous limestone. Sometimes you may trace them on the steep mountain-sides forming between two scarps a narrow platform such as Alpine climbers call a *vire.* The grass in summer or the snow in winter shows them up. On the *flysch* and the Tertiary *molasse* the slopes are gentler, the soil deeper and more humid. These sandstone formations once covered the greater part of the region, but they have mostly been removed by erosion.

The climate itself contributes to increase the verdure and the water supply of the Pre-Alps Rising in all parts at least 3,000 feet above the foreland, they catch the clouds that flee before the westerly winds, and the precipitation is more abundant here than on the tops of

the High Alps, though the latter have twice their altitude. The Vercors tableland is still an unbroken expanse of white when Tarentaise and Maurienne are shaking off their mantle of snow.

### THE GATES OF THE PRE-ALPS

The barrier which arrests the clouds in their flight towards the High Alps does not prevent the waters of the loftier summits finding an outlet to the plain. From the gap at Rives you can see the breach several miles in width through which the Isere makes its escape. There are three similar openings in the wall of the Pre-Alps. One of them gives passage to the Arve, the other two discharge the waters of the Lakes of Le Bourget and Annecy. The steepness of their sides and their direction, which is at right-angles to the folds and ridges they dissect, declare these openings to be *cluses;* but their breadth, the extensive alluvial flats and the lakes that reflect in their tranquil waters the bold outlines of the mountains, are novel features. Unless we bear in mind the latest episode in Alpine history, we shall find them hard to explain.

These *cluses,* which served as outlets to the main streams as early as the late Pliocene period, provided outlets for the enormous glaciers which covered the Alps in Pleistocene times and deposited their debris over Lower Dauphiny as far as Lyons. The depth of these rivers of ice exceeded 3,000 feet, and they forced their way through by widening the *cluses* and gouging out the valley-bottom below the normal erosion-level. It is te this action that we owe the lakes, which are one of the

charms of the Pre-Alps, and also the alluvial flats of the Arve and the Isere, which have probably filled up the former basins of shallower lakes.

The *cluses* in their new form of broad portals divide the Pre-Alps into blocks, each of which has its own individuality, its own name and, one might almost say, its own manner of life.

*Chablais,* which lies north of the Arve, partakes of the characteristics of the Swiss Pre-Alps. Its geological structure is complicated—peaks fall steeply; valleys lie deep: its pastures are extensive and the pastoral life highly developed. *Genevois,* between the Arve and the Lake of Annecy, is simpler in its structure. It is a region of great limestone anticlines, like Bargy; of magnificent ridges, like the range of the Aravis, whose bastions rise to nearly 1,0,000 feet; of wild *causses,* like Parmelan, separated by smiling valleys such as we found in the Jura and find here again in the valley of Grand Bornand, where the villages he in lines among the meadows. The *Bauges,* between the Lakes of Annecy and Le Bourget, are wilder than Genevois. The slim outline of the summits dominating the south shore of the Lake of Annecy is due to close folding deeply dissected by erosion. There are few high villages, and pastoral life on the uplands is less organised.

The Massif of the *Grande Chartreuse,* between the Is6re and Le Bourget, owes its name to the famous monastery which was founded in the depths of its forests. The high valleys are difficult of access, and the population is scanty even now. Over wide areas the forest still rules supreme. *Vercors,* south of the Isere, is as simple in its structure as the Jura. From a commanding eminence such as Grand Veymont or Montuez it is easy to make

out from the relief the run of the underlying rock. The limestone carapace, which is universally persistent, is folded either into regular anticlines, represented by the massive ridges, and wide synclines, which form the dry forest-covered tablelands, or else into narrow troughs preserving a few traces of the molasse, which bring the water above ground again, and so determine the sites of the villages. The rim of the massif is eroded into amphitheatres like those of the vineyard districts of the Jura, though on a larger scale.

The gates of the Pre-Alps play an essential part in their economic geography. By their means it has always been easy to establish communication with the mountains behind. Each of them admits a line of railway, and they are natural sites for towns. Annecy, at the foot of the charming lake which bears its name, is the market town of the Pre-Alps and the Savoy foreland, a district which extends to the base of the Jura, and bears crops as varied and as plentiful as those of Bugey. Chambery shuns the steeper shores of the Lake of Le Bourget and stands in the fertile plain which forms the continuation of the lake in the direction of the Grcsivaudan. This, too, is a region abounding in the fruits of the eaith, where the vines grow on lines of trees between the furrows Grenoble guards the outlet of the Isere.

In all these towns a plentiful supply of water and wood and the enterprise of the inhabitants gave birth to industries which have flourished for ages. Near Chambery the springs of Aix have created a fashionable watering-place. The population of these corridors of the Pre-Alps is increasing at the expense of the mountains. All through the Alps we find this tendency to come down into the valleys, but the most magnetic attraction is

exercised by the longitudinal trench on which the gates of the Pre-Alps open, the long furrow that runs behind their screen of limestone ranges (Fig. 17).

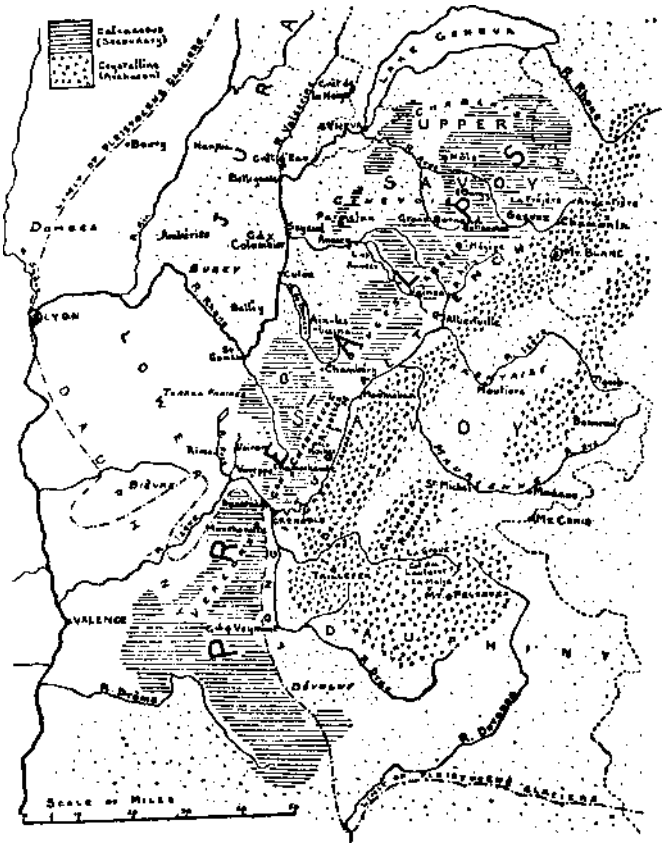


**FIG.17**
**SAVOY AND DAUPHINY**

### THE LONGITUDINAL TRENCH

This feature is most striking at Grenoble as you come out into the Gresivaudan. The Isere gap at Voreppe, between the Grande Chartreuse and Vercors, is still comparatively narrow. As you turn the corner, the steep mountain-sides fall away from one another, and you see before you a plain two or three miles broad fading far away into the north-east. You may follow it for thirty miles up to Montm61ian, shut in between the limestone scarps of the Grande Chartreuse on the left and the gentler slopes on the right, the pedestal on which the ridges of Belledonne are uplifted. Beyond the Chambery gate, which opens on the left, the same trench goes on for another twenty miles to Albertville. Finally, at Ugines, you come to a cul-de-sac. In front of you lies the saddle notched by the wild gorge of the Arly with a cluster of factories at its foot. Cross it, and you come out into the green corridor of Megeve hanging at its north-east end above the basin of Sallanches, where the Arve debouches from the valley of Chamonix.

The trench continues south as well as north beyond the Gresivaudan. Even from Grenoble we can see, away to the south, the broad plain opening out through which the Drac pursues its devious course over a bed of stones with the cliffs of Moucherotte overhanging it. Road and railway cannot follow it through the wild gorges out of which it emerges, but they pick it up again, after a climb of perhaps a thousand feet, in a kind of basin between Vercors and the crystalline massif of Taillefer.

So from D6voluy to Mont Blanc, a distance of 120 miles, there runs a continuous trench plainly following

**the** line of contact between the limestone of the Pre-Alps and the ranges of crystalhne mountains. It may be the most ancient geographical feature in the French Alps. Certainly it has undergone many transformations in the course of the vicissitudes the Alps have experienced since the day of their first uplifting. Some parts of it, like the corridor of Megeve, which lies 4,000 feet above the sea have remained at a high level; others, like the Gresivaudan and the valley of Sallanches, are deeply excavated and, since the retreat of the glaciers, have formed enclosed basins with a climate in marked contrast to that of the mountains that hem them in.

Few westerly breezes find their way into the Gresivaudan. Fogs may linger in winter over the wet meadowlands, but the summer heat is intensified. Out in the plain it ripens the maize-cobs, and up the south faces of the mountains the grapes of the boldly climbing vines. The walnuts and the planes beside the fields and along the roads serve to confirm the feeling that we are in the South, a feeling that is strong upon us on thundery afternoons when the clouds are piled over the neighbouring ridges, while the sun beats relentlessly on the plain.

We can understand the lure of this country in remote ages. Man made his earliest home on the limestone flank of the valley because it was the warmer. The oldest and, until last century, the most prosperous villages, were to be found on that side, villages of vine growers and farmers at the foot of the slope, pastoral villages on the bench of Petites Roches. On the other side hamlets and farms have occupied the benches below the ridges of Belledonne, tier by tier, as high as the fertile Liassic soil extends. Their grassland and arable fields have been won from the forest, which remains untouched only on

the last step overlooking the Isere. Villages were built on the alluvial fans where the gorges that serrate this step open into the mam valley. These villages are now the most important places in the district. The energy of the torrents that come down from Belledonne has set in motion a steadily increasing industrial life. Paper-mills were first in the field, but now there are chemical and engineering works, and electric furnaces glow by night to aggregate alloys. It is astonishing to see the animation that has invaded what once were sleepy little roadside stations, the long strings of trucks on the sidings, and the goods-sheds working at as high a pressure as the factories themselves.

At either end of the Gresivaudan trench, where the Alpine waters emerge from the narrow gorges, industrial activity breaks out afresh. The Drac supplies power to important chemical factories and Vizille weaves silk for Lyons. At the other extremity the Arly turns the turbines of Ugines. There a whole town of workmen's dwellings surrounds one of the most important metallurgical works in France, whose electric furnaces refine steels of every grade.

In the midst of so much activity Grenoble is steadily acquiring metropolitan status in the Alpine region. In its early days it was a market town and a fortress commanding the junction of the routes that enter by way of the Voreppe gap and follow the longitudinal trench either up the Isere or up the Drac. Till the days of the Second Empire it was a garrison town with a population of the ordinary unenterprising provincial type. With the dawn of the twentieth century it sprang to life, and to-day its influence is extending with the industrial movement as it advances further and further into the Alps.

# CHAPTER XIII

## THE ALPS OF SAVOY AND DAUPHINY (*continued*)

### THE HIGH MOUNTAINS

**General characteristics.**—Broad gateways open through the Pre-Alps into this longitudinal corridor, and Grenoble guards one of the entrances. Where shall we find a way out on the other side towards the High Alps? The Isere and its tributary, the Arc, force their way into the Gresivaudan through true *cluses.* The Arve falls into the basin of Sallanches in rapids seething at the bottom of the wild gorges of Servoz. The lofty ranges of whose jagged, snow-covered ridges the long corridor affords an occasional glimpse are a world apart, and to enter it we must thread our way through narrow defiles.

If we ascend the Arc in the direction of Modane, or the Isere as far as Moutiers, the effect of the mountain mass becomes positively oppressive. Long before the glint of the glaciers is visible, the effort *to* fix the eye on the jagged summit apparently hanging in air above the narrow valley becomes a strain on the neck. The stupendous flanks soar upwards five or six thousand feet on slopes you would suppose no human foot could climb. Stony alluvial fans of astonishing dimensions mark the foot of every torrent-worn gully. To reach the villages built upon them the road must sometimes climb 600 feet.

On the higher ranges of the Alps the forces of erosion seem to work with savage fury. Must we lay the blame

on disafforest at ion? Doubtless here as elsewhere man has played his part in the reduction of the forest area, but the climate is largely responsible for the comparative bareness of the mountain-sides, so markedly contrasting with the forest wealth of the Pre-Alps. The mist-loving beech, that reigns supreme on the lower ridges of Vercors and mingles with the spruce on the Grande Chartreuse, has definitely disappeared in Maurienne. The spruce and even, in favourable localities, the larch form forests on the north side of the mountains at elevations 1,600 or 2,600 feet higher than in the Pre-Alps.

Differences in exposure acquire an importance undreamed of at lower altitudes. The *adret* or *endroit*, the site with *direct* (i.e. sunny) exposure, may admit of cultivation up to 6,500 feet, and there are high-lying valleys where the houses climb like wall-fruit to escape the shadow cast by the opposite side. The *ubac* or *envers* (the site *turned away* from the sun) carries only an occasional house. If there is a low place in the wall of the valley, or a bench to break the slope, a chalet may stand there with a patch of meadow beside it. The dryness of the air explains why this question of insolation is of so much importance. Such meteorological observations as have been made in these high valleys show that the precipitation is definitely less than in the Pre-Alps. Modane gets 25 inches of rain, which is less than half of Annecy's 51 inches.

We perceive, then, that the high mountains are loftier, steeper, more exposed to erosion, drier, less wooded, more sensitive to differences in exposure. The culminating points, which are covered with glaciers, reach 12,500 feet in Vanoise, 13,500 in Pelvoux, and 15,700 feet at Mont Blanc. The valleys themselves, though they

are so deeply trenched, are higher than the outer ridges of the Pre-Alps. Bonneval in Maurienne and the Isere valley in Tarentaise both lie nearly 6,000 feet above the sea.

**Details of the structure.**—Our study of the region may be pursued still further. Even if we confine ourselves to the bottom of the valleys, it will strike us that there are places where they are less shut-in. There are constrictions which barely leave room for the modern highroads, and which the old roads always avoided, but broader stretches intervene, recalling, on a smaller scale, the Gresivaudan plain. The basins of Saint Michel de Maurienne and Moutiers, like that of Tignes in Tarentaise, seem to be completely enclosed. Upstream, as well as down, a bar of rock is shot, like the bolt of a door, across the valley. The narrow gorges represent the river's effort to force these bolts.

If you wish to enter a side valley, you can rarely do so at the water-level. The stream is boiling at the bottom of a gorge whose walls are sometimes absolutely vertical, or else it is pouring down in a waterfall. Even the modern highway must wind its way up to the shelf that marks the point of junction with the main valley. As you begin to rise, you realise that the side valleys seem actually to hang suspended at a higher level.

The walls of the main valley are also interrupted here and there by gentler slopes, here called *replats, replatons, planets,* or *plans.* These benches are revealed to the distant view by their fields and meadows. As soon as you grasp all the details of the jagged crests themselves, you are struck by the constant repetition of the same motif, a succession of hollows or amphitheatres suspended above the valleys, which geographers call

*cirques* or *corries*, and the natives *combes*. Here the snow lies for most of the year, and sometimes the gleam of a lake will catch the eye.

The alternation of basins and barred gorges in the main valleys, the raised benches *(replats)*, the shelves at the point of entrance of the hanging valleys, and the *cirques* that cut up the crests, form a group of special features common to all the higher Alps (Fig. 18).

The explanation of them might naturally be sought in the geological structure. It is the fact that some of the benches in Lower Maurienne occur on platforms of limestone, and that some of the bars across the gorges consist of harder rocks. But all these features are to be found in massifs formed of homogeneous rock. They are nowhere more striking than in the granite of Pelvoux. If geological structure is to explain the geography of the High Alps, then it can only explain its general lines. The higher massifs of Savoy and Dauphiny are nearly all crystalline—Belledonne, the Grandes Rousses, Vanoise, Pelvoux and Mont Blanc. And folding will equally fail to account for the arrangement of the main valleys. The reason became plain when geologists discovered the complicated nature of the tectonic dislocations. Instead of producing simple waves as in the Jura, or more or less compacted folds as in the Pre-Alps, the earth-movements have piled up masses of *overfolded* strata. The picture, in fact, presented to our imagination is one of geological strata many thousands of feet in thickness once overlying the highest existing peaks and since removed by erosion.

**The work of the glaciers.**—To understand the forms characteristic of the high mountains we must go to the


FIG. 18—ALPINE TOPOGRAPHY

The upper figure shows the glacial conditions which prevailed some 20,000 years ago, and which explain the present topography as shown in the lower figure. Upper: S, serac; M, medial, and LM, lateral, moraines. Lower: C, cirque; HV, high valley; Vr, rock bar; G, gorge; B, basin; R, bench.

heads of the valleys where the water drains from the glaciers. To stand at the summit of the Col du Lautaret or on the terrace of La Grave and see the Meije sparkling at our feet will not tell us all we want to know; we must go to the largest glaciers of all, preferably those round Mont Blanc, where they completely fill the valleys, flowing into one another like rivers and descending to the point where the forests are in full growth. The most surfeited sightseer cannot fail to be stirred by the magnificent grandeur of the panorama he will see from the Flegere, or the imposing spectacle that meets his gaze from the Jardin de Talefre, that rocky islet emerging from a sea of ice, where flowers bloom at the bidding of a burning sun, and butterflies come to visit them. The tints of the crevasses and s^racs under the dazzling light, the unparalleled hues of the sky and the granite scarps, will amply repay him. But there is also a lesson to be learnt from these landscapes, for in them we have a picture of all the valleys of the Alps as they were in the Pleistocene epoch.

The slow movement of the ice takes visible shape in the fractures. You will notice that they occur wherever the bed of the ice is constricted, whether in the main glacier or at the point of entry of a tributary. Undoubtedly they are due to a too rapid descent, like the waterfalls of a stream, and at these points the river of ice is less deep. An indication of the tremendous thickness of the ice is to be found in the lateral moraines which show the level at which, for example, the front of the Argenti&re glacier stood less than a hundred years ago. A body of ice of the dimensions of the Mer de Glace must necessarily erode its bed as a river does. Its progress is slower than that of a stream, but its volume is

enormously greater. What must have been the effect of the Pleistocene glaciers, which filled their valleys to a depth of more than 3,000 feet!

As in the case of the modern glaciers, their powers of corrasion depended on the slope and the width of their beds. They occupied valleys still in the youthful stage, excavated by the erosion of the mountain torrents when the Alps had not yet attained their ftill elevation. The occurrence of the alternate basins and bars, as well as the presence of hanging valleys, is attributed to the unequal erosion of the ancient glaciers.

The benches that occur at different levels on the valley sides bear witness to the complicated vicissitudes of the Pleistocene epoch in the Alps. The glaciers of the present day advance or retreat according to variations in the climate, which may be drier and warmer or, again, wetter and colder for several successive decades. The variations in the Pleistocene glaciers were on a scale corresponding to their dimensions. Several times over they retreated into the upper valleys to advance again to the outer limits of the Alps. Consequently torrent erosion alternated repeatedly with glacial erosion. The latter widened the valleys, trenching them unevenly according to the mass of the moving ice, its breadth and gradient: the former operated to adjust the fall of the *thalwegs* and in general to deepen all the trenches through which the water ran off.

The lofty massifs have yet other lessons to teach. If you climb a high mountain, you learn something of the conditions that prevail among those serrated peaks: the rock-falls in the couloirs; the rotten rock that yields under your foot or your grasp when you try to hoist yourself up; the piles of angular blocks on the

ridges, all show the ceaseless work of the weather attacking with its weapons of frost and thaw even the hardest rocks, wherever the slope denies them the protection of the snow. Sometimes an avalanche rolls down on to the *nevi* at the bottom of the amphitheatre of crags. The origin of the niche-like hollows carved out of every summit becomes plain: they are ancient gathering grounds of glaciers like the one at your feet. They eat away the opposite sides of the mountain, reducing it to a narrow, jagged ridge, and when the glaciers disappear from them, they form bowl-like depressions suspended above the valleys.

All the features here attributed to glacier-action are not absolutely peculiar to the Upper Alps. The rivers of ice that debouched in Pleistocene times through the gateways of the Pre-Alps filled the longitudinal trench of Gresivaudan to a great depth, sculptured the north slopes of Belledonne into shelves and benches, and prepared the sites for the villages and factories at the mouths of the gorges of adjustment. Local glaciers have carved *cirques* here and there in the summits of the Pre-Alps also; but it is only in the Upper Alps that the imprint of the ice is so universal as to remove the evidence of almost every other influence, even that of the original structure. So long did the glaciers persist that there are some high valleys from which they seem to have departed only the other day. Their work has not only profoundly modified the relief, but also in some respects facilitated human settlement by directing it along clearly defined routes.

**Life in the Alps.**—The benches which break the slopes of the mountain-sides afford soil both deep enough

for cultivation and meadows and level enough to admit of the easy construction of dwellings and roads. In many places they lie in series, one above the other, each with a village or hamlet of its own. The shelves of the hanging-valleys offer similar advantages together with the additional one of opening a window through which the sun may shine on the opposite side of the valley. Frequently the bars across the ravines carry a village too, keeping watch upon the ancient highways that invariably scaled the rise on which the village stood. The foot of a gorge of adjustment offers a convenient site for a factory, whose electric furnaces lighten the darkness of the night. There is therefore ample choice of sites for human settlement, but one feature that is peculiar to the High Alps is the isolation in which the populations of the upper basins live. Beyond the wild gorges which pierce the mountain barriers human societies have developed. The district names in the Alps are the names of valleys, either continuous basins or strings of smaller ones. Tarentaise and Maurienne are instances in point. When Christianity reached these remote regions, a religious centre had to be established in each, and there is a diocese of Tarentaise to this day. Ancient customs linger in Maurienne. There are villages whose women deck themselves on days of festival in costumes as rich and distinctive as those of Brittany.

Here we find the most specialised forms of Alpine life, revealing a gradual modification of habits adopted in certain parts of the Pre-Alps. The essential fact is the temporary character of the population.

It would give you an entirely false idea if you estimated the population, say, of Lower Tarentaise by the number of chalets dotted about the sunny slopes, or

even of the hamlets nestling on the benches perhaps 3,000 feet above the valley. The native will tell you such and such a bit of meadow is called the *montagnette,* or such and such a pasture the *montagne.* The permanent village lies on an alluvial fan or on a lower ledge, and that is where the hay-fields are to be found, the corn-land and the orchards, and sometimes a vineyard extending up the *adret.* Stock-raising is rarely the only, though always the main, occupation. In spring the flocks and herds are driven up to the *montagnette,* where the ground so recently deserted by the snow is now a carpet of young grass. Each family has its own meadow there, its barn and its chalet, sometimes standing alone, sometimes grouped with others on a bench which was cleared of forest many centuries ago. Sometimes real villages have grown up in these elevated positions, and a few of the houses may be inhabited all the year round. The greater part of the population goes up to these hill-stations, for there is much to be done: irrigation channels to be kept in repair, hay to be mown and housed, and the winter wood supply to be cut. There is nearly always a chapel where the congregation meets on Sundays. Directly the snow leaves the higher ledges and the *cirques,* the flocks and herds ascend to the *montagne,* and there the herdsmen find shelter for two or three months in more primitive chalets. Meanwhile, a portion of the inhabitants descend again to the valley to mow the second hay-crop, harvest the cereals and pick the grapes. Autumn finds nearly everybody at the *montagnette* again, where the animals browse on the uncut after-grass. In winter people tend to concentrate in the lower villages. All these migrations, *remues,* as they are called, enable the inhabitants to derive from their land the

maximum benefit compatible with the zonal arrangement of the vegetation and climate.

The vine is present in all but the highest valleys. In them even rye is difficult to harvest, but isolation accounts for the persistence of old-established communities, some of which are to be found in actual proximity to the glaciers. Improvement in communications will probably lead to the desertion of the Upper Alps.

The emigration of the people of Savoy to Lyons and Paris began early in the nineteenth century. The movement has gained momentum, but the advantage is now being reaped by the lower valleys of the district, where the development of industry and towns offers wages and amusements unknown in the mountains. There are, however, two influences which may check it: the flow of tourists towards the mountains in quest of the glaciers, and the exploitation of water-power. Since the railway was completed to the foot of Mont Blanc, the Vale of Chamonix has enjoyed a prosperity well calculated to keep the mountam-folk at home. In Upper Maurienne, hydro-electric plants are multiplying and the villages in the valley-bottom growing bigger, while those on the upper ledges, which formerly were the more prosperous, are losing their inhabitants.

These, however, are conditions of purely local significance. On the whole, the upper mountains, which for many centuries witnessed an upward movement of settlement to the extreme limit of the habitable area, a movement rendered possible only by the ingenuity shown in extracting every possible advantage from unpromising surroundings, must continue to lose population to regions where life is less hard. The new

factor in the situation is the apparently permanent establishment of the inhabitants in the outer, Pre-Alpine zone, where communications are easier and modern towns on an industrial basis are growing up. The Gresivaudan and the countryside round Annecy and Chambery rank among the most prosperous regions in France, and Grenoble shares with Lyons and Marseilles the reputation of being one of the most enterprising cities of the south-east.

# CHAPTER XIV

## PROVENCE

THE very name of Provence calls to the mind of every Frenchman the picture of the sunny South, that *Cote d'Aznr* whose enchanting shores extend from Marseilles to Nice. Historically, Provence was the first territory in Gaul to be securely occupied by the Romans, who found in it the Mediterranean and mountain scenery of their own Italy. Geographically, Provence is defined as that region between the Rhone, the sea and the summits of the High Alps, over which the climate, vegetation and occupations associated with the Mediterranean extend.

## NATURE IN MEDITERRANEAN LANDS

Whether you descend the valley of the Rhone, the Durance or the Var, the effect is equally striking and wholly unmistakable. About Montehmar, Sisteron or Guillaumes, the same change occurs. Clouds and mists disappear, and a lively light bathes mountains that grow barer and more rugged, and drier and dustier plains. The bright greens of our northern trees are replaced by the grey-green of the olive, or the sombre tones of the pine and the evergreen-oak, or by a carpet of thorny *tnaquis,* emitting in spring-time a powerful scent.

Make a stay in the country and you will learn to appreciate the mildness of the winters, the heat of the

summers, the rarity of rain *in* the warm season, the heavy downpours in spring and autumn, and the violent northerly winds known as the *mistral.* The average January temperature is nine degrees (Fahrenheit) higher at Marseilles than at Paris. In July the difference is practically the same. The annual rainfall is rather lower on the banks of the Seine, but the long droughts which are the rule in Provence are there unknown. For six months of every year, from May to October, and sometimes for a still longer period, the sky, relentlessly blue or veiled only by a few passing clouds, refuses the least drop of water to the parched earth.

The varying aspects of the vegetation respond to the rhythm of the climate, so different from that to which our northern forests alternately put on and off their garb of green. A fall in the temperature is perceptible in winter, but it is not the only check on growth: the summer drought has the same effect. The spring rains, coinciding with the rise of the thermometer, cause the tender leaves and flowers of the bulbs to appear suddenly from the bare ground. In summer, everything vanishes, but traverse the country after the first rains of autumn and you will be surprised to see it deck itself anew in a cloak of verdure and flowers. Natural meadows perennially green are a thing unknown in Provence.

The trees have contrived to adapt themselves to the Mediterranean climate. The olive and the evergreen-oak have narrow, thick, shiny or even prickly leaves, and retain them all the year. There is nothing resembling our heavily timbered forests. Among the pines and the evergreen-oaks, whose crowns rarely touch one another, the ground is covered with an undergrowth of bushes with shiny leaves, like the laurel, prickly or needle-

shaped leaves, like the broom or the lentiscus, or scented ones like the cistus. Off the beaten track this undergrowth makes walking difficult, and where the forest has been destroyed it still persists, forming what is called the *maquis*. On the drier soils, and particularly the calcareous, even the *maquis* disappears. Scattered tufts of broom or a few small stunted oaks with prickly leaves like those of the holly are all that grows among the white stones. This is the *garrigue*.

Here, as elsewhere, man has modified the vegetation. His efforts are largely responsible for the disappearance of the forest, and where he has failed to maintain the land in cultivation, the spread of the *maquis* and the *gamgues* must be set to his account. Cereal crops he grows, of course, and he plants trees as well, not in regular orchards round the villages, as in the north, but scattered about the fields—almond-trees and olives for the most part. Even vines may frequently be found in the fields, planted in rows between the furrows. But the olive is the really distinctive sign of the Mediterranean landscape. It travels north along the valleys, and its limit seems to be determined mainly by the relief. It was the uplift of the Alps that established the confines of Provence.

From the borders of the Mediterranean to the snowy summits of Mercantour or Pelvoux, a series of corridors, massifs, tablelands and mountain-chains rises in successive stages, and one by one the distinctive characteristics of the Provencal region slowly fade away. We shall understand the nature of the changes more clearly if we make the distinction between an Upper Provence, more or less Alpine in character, and a Lower Provence, which is also fairly mountainous, but un-

mistakably Mediterranean throughout. The mistral-swept plains of the Rhone present yet a third aspect.

## UPPER PROVENCE

The basins of the Middle Durance, its tributary, the Verdon, and the Var, may be taken to represent the domain of Upper Provence. Its Alpine affinities are evidenced as clearly by the bold relief of its mountains and the depth of its valleys as by its folded structure; but even here the Mediterranean climate exerts its influence.

In the middle of summer, the railway journey from Digne to Puget Theniers reveals a region as arid as the Moroccan *bled.* Naked rock on every side, dotted with a few green clumps of lavender or thyme and a few bushes of kermes oak; limestone cornices crumbling on to slopes of clay; wild ravines opening in mountain-sides of black schist; huge alluvial fans of mingled black and white pebbles, choking the valleys till the slender trickle of the Bleone or the Asse is barely to be discerned amid banks of shingle a mile or more across. Here and there, plantations of pine, the work of the Forestry Department, emphasize the ordinary bareness of the mountains. Man may be partly responsible for the disappearance of the trees, but this region assuredly never knew the fine forests of beech and conifers that adorn the sides of the valleys in Savoy and Dauphiny.

The wide extension of the limestone beds contributes to the aridity. When they are raised in compact folds, they form that characteristic feature of Provence, the *barres,* through which the valleys cut their way in narrow *clues.* When spread out in broader undulations, they

form the tablelands called *plans*, regular *causses*, more desolate even than those of the Central Massif and crossed by canons more steeply walled than that of the Tarn. Daylight scarcely penetrates to the bottom of the gorge of the Verdon; the *Plans* of Canjuers and Caussols are regular deserts of stones.

No Alpine region has a sparser population, nor one that diminishes more rapidly. In the district of Castellane the density fell from forty-four to the square mile in 1851 to thirty-one in 1901, and barely twenty-six in 1906. The only places that retain their population are the occasional basins formed by the expansion of a valley between two *clues*, as at Entrevaux on the Var, Digne on the Bleone, Castellane on the Verdon, and in the Durance corridor, where alluvial terraces are invariably arranged in tiers above the vast shingle-banks of the great river.

There, on the slopes sheltered from the north winds, such Mediterranean crops as the vine, the almond and the olive itself make their appearance. The houses are grouped after the southern fashion, their high three-storeyed fronts bordering the narrow streets and giving the veriest village the air of an old town. Nor is there any lack of genuine old towns as well. They are nearly always to be found in a commanding situation, with the castle perched on the limestone *barre*, or *baou*, guarding the *clue* and the highroad through it, as at Sisteron; or else they are ensconced on the top of some hill isolated by erosion, as at Forcalquier. Even the largest of these places are inclined to somnolence, and it requires all the official business of a departmental capital to maintain a little animation on the *Cours* at Digne.

## LOWER PROVENCE: THE COASTAL REGION

To the south of a line marked by the Arc and the Argens the appearance of the country changes.

No part of this region is more than thirty miles from the sea. From the vantage ground of the limestone *baous* that look down on Draguignan or Grasse and their olive-groves and fragrant gardens, it may be descried glittering in the distance. To reach it there are mountains to be crossed or circumvented, but they are nowhere much more than 3,000 feet in height—little massifs separated by narrow plains where the life of the Mediterranean reveals itself in all its luxuriance. The Alpine folds persist to the gates of Marseilles and Toulon, but the relief we associate with them has lost all continuity.

Indeed, the coastal ranges east of Toulon bear no relation to the Alps. The lumbering outlines of the Maures and Esterel show them to be ancient massifs, built of schists and crystalline rocks, profoundly different from the limestone ranges. The gleaming escarpments that make so wonderful a background to Toulon Roads, or the white crests of Sainte Baume and the Etoile as seen from Notre Dame de Ia Garde, have nothing in common with the mountains between Hyeres and Cannes. The contrast is accentuated by the vegetation. Nothing but thin pine-woods cloak the nakedness of the limestone ranges in the shade of the *ubacs;* their flanks are usually coveied with a scanty *garrtgue.* On the other hand, the slopes of the Maures are clad in forests of cork-oak, which are regularly cut over, or fine plantations of pine with a thick undergrowth of thorny scented shrubs. The fires which ravage these forests never

destroy the *maquis*. Some valleys in the Maures still shelter groves of chestnuts, and near the highest points the beech appears.

These ancient massifs and limestone ranges come down to the sea. The coast is a succession of promontories cut into cliffs by wave-erosion, of little creeks where the back-wash still surges, and broader bays with little waves lapping the beach, and sometimes a lagoon behind it edged with beds of reeds. This broken shoreline is fringed with rocky islets. Havens are numerous, but rarely very large, and suitable only for vessels belonging to the coast. Access to the interior is impeded by steep cliffs or swampy plains. The insecurity of the littoral, which was exposed until the thirteenth century to the incursions of the Barbary pirates, has contributed to keep the population inland. Old villages may often be found hidden in some little valley invisible from the sea.

Thus Lower Provence for a long period lived a continental life. To find the most primitive type of it we must seek the vales that wind between the massifs. The agriculture is based on olives, vines and wheat in close association. The furrows run in the red earth, between rows of vinestocks or under a canopy of grey-leaved trees. Irrigation is little practised. The beautiful meadows it produces along the Canal de l'Huvanne, just outside Marseilles, give one a curious sensation of straying into another clime.

The spread of *agrumes* (orange and lemon trees) and the growing of flowers and early fruits and vegetables are modern developments consequent on the acceleration of transport. But they are steadily transforming the face of Lower Provence by attracting the population towards the coast. For there, in corners sheltered from

the mistral, the centuries have witnessed the gradual introduction of the fleshy-leaved plants of Mexico, the palms of Africa, and the oranges and lemons of the Far East. To-day, they belong essentially to the landscape. Oranges, it is true, are a difficult crop and ripen late, but the orange flower is distilled for the scent-industry of Grasse and Nice. For this trade, too, a beginning has been made with the cultivation of flowers, particularly roses and carnations, and with the planting of mimosa, whose yellow clusters sweeten the air of spring. The fresh-cut flowers can be sent by rail to Paris, and that is why fields of roses sheltered by straw-mats cover so many acres in the plain of Hyeres. The birth and development of the early fruit and vegetable business are also due to the railway. Strawberries and artichokes ripen under the peach trees, early beans succeed them, and then potatoes. There is no end to what the land will yield with the help of manure, tillage and irrigation.

The railway has been a godsend also to the little towns of the *Cote d'Azur*. Every year sees an increase in the flood of visitors who spend their money so lavishly. The growth of Nice is a consequence of this development of the Mediterranean tourist traffic. Its hotels are now scaling the cliffs above the old town, but in summer their palatial buildings and the public promenades and magnificent gardens lose all the animation they display in the seasons of winter and spring. This artificial life is spreading further and further westwards; by way of Cannes, Antibes and Saint Raphael, it is reaching the foot of the red porphyry crags of Est6rel. It flourishes again in the sheltered coves of the Maures along the coast to Hyeres. It has become, in fact, an essential element in the geography of Lower Provence.

### THE RHONE PROVINCE

The development of rapid means of communication has also determined the startling changes in the appearance and economic life of the plains of the Rhone and the Lower Durance.

On the crest of Ventoux the snow lingers late into the spring; Luberon is lower, but can still boast a patch of woodland here and there; the narrow wall of the Alpilles runs down to the edge of the Rhone: and each of them commands vast horizons. There are arid limestone tablelands like the *Plan de Saint-Chnstol;* high terraces of ancient Alpine alluvium laid down in former ages by the Durance, such as the *Crau;* and immense plains of recent alluvium, to which the Rhone is ever adding as its branches grope their way among the lagoons and the sand. Over these flat expanses, prolonged northwards by the valley of the Rhone into a tapering corridor, the mistral holds sway. Its breath bends the trees towards the south, drying up the soil and the young growth. Great hedges of cypress shelter the crops and fringe the dusty highways and the canals.

In former days all the life of the region was concentrated on the Rhone, the ancient trade-route to the North. Its towns are full of Roman monuments and in the Middle Ages attracted to their fairs merchants from every quarter of the South. The high terraces of the river were never occupied. In winter only the flocks of sheep coming down from their Alpine pastures invaded the Crau. The *Camargue,* as the plain of the delta is called, was the domain of the herdsmen. Between the pinewoods growing on the dunes and the vast reed-

bordered lagoons, the horses and cattle wandered as freely as on the Argentine *pampas,* to be rounded up by uncouth horsemen when the proper time arrived.

On the middle terraces, less arid than the Crau and less moist than the delta, the little villages lay scattered with here and there a large farm, a *mas,* occupying a more fertile spot. As everywhere throughout the inner country of Provence, wheat, vines and olives were the basis of the economic life. Mulberries planted beside the fields and roads served for the rearing of the silk-worm. On the edge of the limestone tablelands, the lavender was harvested, and truffles dug in the oak copses. Descriptions of this life, which is not yet entirely a thing of the past, may be found in the pages of Mistral, a poet, but a close observer too.

To a large extent the Camargue is still devoted to stock-raising on the ranching system, but on the heavy soils won by draining from the borders of the lagoons, they are beginning to plant the vine. The stony terraces are gradually being transformed by irrigation. The olive and even the vine are yielding place to cereals, fodder-crops and sometimes even hay-fields, while early season crops are now grown under cover of the fruit-trees.

The bulk of the water is derived from the Durance by a network of canals spreading fanwise to the north and south of the Alpilles. The Carpentras canal also collects the contributions of the Sorgue, the Ouv&ze, and other smaller streams. This system is not of recent origin; it has only been completed by degrees, and is capable of still further extension. Its full effect was only felt when the railway made it possible to dispatch early delicacies to the great towns of the North, and to distribute the products of the stock-raising called into existence by the

development of fodder-crops. The stations of Cavaillon and Carpentras are now as busy as any on the system of the P. L. M. In the season whole train-loads of fruit and vegetables are dispatched every hour of the day.

The Rhone plain was always the richest portion of Provence; to-day it exercises an attraction more powerful even than that of the *Cote d'Azur* itself. Hither the population flows that is deserting the arid mountains of Upper Provence. In the district of Carpentras, the density was 119 per square mile in 1801; in 1901 it had reached 210. In the Avignon district the rise between the same dates was from 249 to 453, and by 1926 it reached 616. Only the great towns of Provence, Nice and Marseilles, can show a comparable increase.

## URBAN LIFE IN PROVENCE

The development of the towns is as characteristic a feature of Provence as its sky and its blue sea, its pebble-strewn soil, its olive-groves and irrigated gardens. The concentration of humanity on sites chosen with an eye to trade or defence is a peculiarity of the Mediterranean and the Latin race. Italy is dotted with little towns, each of which has known its hour of greatness. Provence, which became Latin at an early date, has seen great cities flourishing as well.

Many of them are now just modest little country towns, centres of local administration or of rural districts, awakened from their slumber at intervals by some local fair. The old towns of the interior strung out along the Durance or the Var are of this kind. Even Aix,

the ancient capital of Provence, and the chief town of a department, the seat of the University and the Court of Appeal, and the centre of the oil trade, seems very dead-and-alive beside the busy cities of the coastal region and the Rhone plain. All the life-blood is draining now into these organs of economic activity.

The cordon of towns that check the speed of the expresses through the Rhone valley dates from the earliest days of the Roman occupation. Whether, like Aries, Tarascon and Avignon, they were set there to defend a bridge, or placed, like Orange, with their backs against some isolated hill that commanded a highway, all alike are rich in memorials of the past—an arena or an ancient theatre, ramparts dating from the time of the Crusades or a castle of the Pope. The fairs have lost the importance they enjoyed in the Middle Ages, but the commercial impulse that started with the spread of early season crops in the plain of the Comtat is felt as fully at Avignon and Mont£hmar as at Cavaillon, Carpentras or Salon.

To find, however, the most vigorous urban organisms, we must go to the coast. Between them Marseilles, Toulon and Nice account for a third of the total population of Provence. In former days sea-life maintained in activity a large number of small harbours, but it tends more and more to concentrate in a few places. The swarms of sailing vessels and the small number of steamers that discharge timber and load wine at the quays of Nice fail to account for the enormous development of that town or for its 200,000 inhabitants. As at Cannes, the growth of gardens, villas and hotels is due to the Mediterranean tourist traffic. Toulon owes its animation to the fleet of warships that finds shelter

in its wonderful roads, and to its arsenals and ship-yards, the indispensable complement of a first-class naval base. Modern industrial life is concentrated in Marseilles.

With its 650,000 inhabitants and its basins and docks, Marseilles is the busiest seaport on the French coast, and indeed in the whole Mediterranean. When the Algiers boat, which sails from the Lazaret, takes you past the long line of docks extending from the old harbour for close on three miles, the number and size of the vessels you meet, the various flags they fly and the different cargoes they carry remind you of New York. The tonnage figures will no longer surprise you. They amount to twenty millions and are constantly increasing despite the shocks administered by strikes and the turbulence of a population drawn from every race under the sun.

The sanctuary of Notre Dame de Ia Garde, perched on a rock whose silhouette has been a sea-mark for centuries, affords the best view-point for those who would understand the town's topography (Fig. 19). In the welter of houses immediately below us we recognise the original nucleus. These are the quarters round the old harbour. Their narrow streets come tumbling down from the hills that protected the natural cove from the force of the mistral. Several centuries before the Christian era the Greeks observed the advantages of that position. The great modern arteries attract the gaze to their uncompromising lines. It requires an effort to distinguish the successive stages in the growth of the town, overrunning in turn all its lines of fortifications, till the last was finally demolished at the beginning of the nineteenth century. No such effort is necessary to

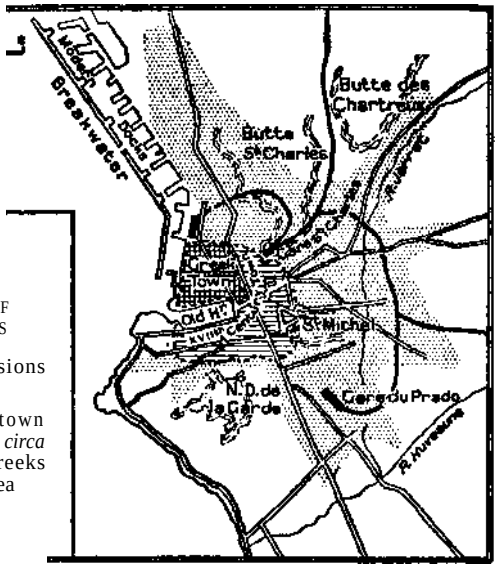


FIG. 19

GROWTH OF MARSEILLES

Modern extensions stippled

The original town -was founded *circa* 600 B.C. by Greeks from Phocaea

realise the effect of the hills upon the outward progress of the suburbs.

In the seventeenth century they began to creep between the hills of Saint Charles and Les Chartreux along the road to Aix, and between Saint Michel and La Garde along the Toulon road. All efforts to restrain building to the interior of the fortifications on the steep hillsides proved fruitless. The star-shaped arrangement persists in the close-set accumulation of buildings now grown to such enormous proportions. The houses extend along the main roads for a distance of three miles from the Old Harbour, and streets are pushing northwards with the new docks, and encircling the Massif de Ia Garde, whose flanks are covered with private houses.

That such a site should have been chosen for a great town is indeed a little surprising. Its inconveniences have become obvious in the course of development. The steepness of the ground has made it necessary to build out the main railway station on the *Butte Saint-Charles* on sustaining walls, and, until the Durance Canal was constructed, the inhabitants suffered severely from the lack of a sufficient water supply. But the Greeks, who settled in the cove of the Old Harbour more than 2,000 years ago, were anxious only to find shelter from the mistral, and this was the first that offered itself after their experience of the inhospitable beaches of the Rhone delta. At a later date, the advantages of the position in relation to the great highroads of communication outweighed its disadvantages as a town-site. The trade that for so many centuries has passed by way of the Rhone valley demanded some outlet to the sea. Marseilles was the nearest harbour, and the least liable to silting. A mole running parallel to the coast is all that is necessary to enclose basins of deep water.

But the great expansion of Marseilles dates only from the nineteenth century. The entrance of France into Algeria and Tunisia not only removed the menace of the Barbary corsairs, but increasingly developed the traffic between the two shores of the western Mediterranean. The piercing of the Isthmus of Suez established the trade with the Far East in a permanent channel and made the port of Marseilles one of its termini. The railway that follows the valley of the Rhone has become the feeder of the port. The process will be completed by a canal, now nearly finished, which will bring the Rhone barges direct to the gates of Marseilles. When the project for the canalisation of the great river is realised, and

its navigation is extended as high as Geneva, Marseilles will witness a further increase in her importance.

There is nothing to astonish us, therefore, in the economic growth which has nearly trebled the population of Marseilles in less than eighty years, raising it from 220,000 in 1850 to 652,000 in 1926. Indeed, we may look for greater figures still.

Here again we find the same problem of the relations of a town to its geographical surroundings which we noted at the beginning of these studies in the case of Paris, and it is marked with the same complexity. To understand those relations we must look very far beyond the immediate neighbourhood. Topography determines the position of the original nucleus of the aggregation and the lines on which it must develop. But the importance, whether of a capital city or of a great port, is determined by its situation in relation to the great highroads of traffic, and they, in turn, are fixed by physical geography and history.

# CHAPTER XV

## THE BASIN OF AQUITAINE

A MERE glance at the map of France reveals a broad depression lying between the Central Massif and the Pyrenees, which geographers call the Basin of Aquitaine. Like the Paris Basin, it forms a centre on which the waters descending from the mountains and uplands that surround it converge. Nearly the whole of the Garonne Basin belongs to it; only the Charente and the Adour escape the attraction which the estuary of the Gironde appears to exercise. Hydrographical unity is more evident than in the Paris Basin, and we find nothing resembling the capricious behaviour of the Meuse and the Moselle. The relief is less broken, and the geological structure simpler. As you traverse this vast region, wide areas of it produce an impression of uniformity. You may spend hours in the train and never escape from the monotonous landscape of the low hills of molasse, dotted with farms; the forests of the Landes seem never to have an end. The tones of the sky show little variation; they are brighter, of course, than in the north, but they have none of the brilliance that you would expect in the latitude and vicinity of the Mediterranean.

Three influences are dominant in Aquitaine and imprint upon it its peculiar characteristics: the Central Massif, which borders it on the north-east, leaving two gateways open to the Paris Basin and the Mediterranean respectively—the Poitou Gate and the Gap of Naurouze:

the Pyrenees, whose lofty rampart shuts it in completely on the south, and finally, the Atlantic, to which it presents an extensive frontage.

All the large right-bank tributaries of the Garonne come down from the Central Massif: the Tarn, the Lot and the Dordogne. A girdle of Secondary strata, whose age decreases with their distance from the Archaean massif, must once have existed on this side as on the edges of the Paris Basin, but they have been dislocated and partially incorporated with the mountains in the Causses. Traces of them are only to be found in the Poitou direction, in the *campagnes* of Saintonge and Angoumois drained by the Charente.

The sudden rise of the ground on the south face of the Central Massif causes abundant precipitation, but in this respect the influence of the Pyrenees is far more noticeable. From all points of view this is the most important influence.

The girdle that surrounds the Paris Basin can show nothing to be compared with this formidable barrier. It stands nowhere less than 3,000 feet above the plains, and its snow-covered peaks rise to a height of 10,000 feet. Rather less lofty than the Alps, with which they share a common history, the Pyrenees probably rose a little earlier than they. Erosion began the work of their demolition in the middle of the Tertiary era and their debris are spread over most of Aquitaine. They form the main constituents of the rock called *molasse,* loose sandstone and clay with small beds of limestone, that gives so general an appearance of uniformity to the landscape. They yielded, in the Pleistocene period, the masses of alluvium that form the terraces of the Garonne and the sands of the Landes. They still continue to encumber

the beds of the rivers and silt up the estuary of the Gironde.

The screen of the Pyrenees operates more effectively to check the rain-bearing winds than do the uplands of the Central Massif. It is interesting to watch, from the Pic du Midi, the Altantic clouds rising from the hon/on, and then, before their bulk has had time to cast a shadow on the plain, the mists forming all over the mountain-sides. Torrents of rain will fall along the whole front of the Pyrenees without any hint in the barometer;- the mere contact of the wind with the face of the rampart forces it to rise and condense its moisture by cooling When a barometric depression is advancing over Aquitaine, its first effect is to summon up a current of air from the south. The wind passes over the crest of the Pyrenees, emerges from the valleys on the northern slopes and spreads out over the plain with effects analogous to those of *the John* in Switzerland. This wind is known as the *atitan.* It blows in disconcerting gusts as far away as Toulouse and even further, breaking the smaller branches of the trees, drying up the soil and producing on man and beast the oppressive effect of thundery heat, till the wind veers to the west and brings back the clouds and the rain. The *autan* melts the snow in the mountains and causes unexpected floods in spring. But the most disastrous spates in the valleys of the Pyrenees are those launched by the great downfalls in summer thunderstorms. The rapidity with which they reach Toulouse, and the slowness with which they drain off the flooded plains, render the Garonne one of the most formidable rivers in France.

Even in human geography the influence of the Pyrenees can be traced. Some interchange has existed

and still exists between the northern parts of Aquitaine and the Central Massif: cattle from Limousin are brought for fattening to the rich grassland of the Charentes, and in earlier days the population moved up from the limestone districts to the "cold lands." But nothing in this kind merits comparison with the intimate relations that subsist between southern Aquitaine and the Pyrenees. The "men of the Artege" are looked for in the Castres district when vintage and harvest-time come round. The back-flow of the mountaineers to the plains, from which in ancient times the high valleys must have derived their population, is also noticeable in Armagnac. The water-power of the Pyrenees is now being used to light towns and villages fifty miles away from the mountains, and by the same means it is hoped to electrify the whole railway-system of southern France.

The shadow of the Pyrenees seems to dominate the whole of Aquitaine, and the breath of the ocean permeates every corner of the land. The Atlantic front is longer than the mountain wall. From Biarritz to La Rochelle, Aquitaine lies open to the ocean breezes for a distance of nearly 200 miles. It is not to be wondered at if the Mediterranean climate is nowhere to be found. The olive only makes its appearance at Carcassonne, a few miles beyond the summit of the Naurouze gap.

For all that, there is a touch of the South in the climate of Aquitaine. The summers are hot with violent thunderstorms, the winters usually mild, but with spells of cold that become severer the further you get from the sea. Precipitation is most abundant at the latter end of spring, as in the centre of the Mississippi basin. Maize, an importation from America, finds the same favourable

conditions which have caused it to flourish in Lombardy, Hungary and Roumania. Its feathery heads are one of the characteristic elements in the landscape. All the southern fruits find themselves at home, and bring their appetising harvest to perfection under the lingering warmth of the autumn sun. The vine in particular finds those medium conditions which increase the yield without hurt to the quality. Generally speaking, the climate of Aquitaine has to thank the Atlantic for an increased humidity and greater equability of temperature.

It may seem surprising that maritime life should be comparatively little developed; but the coast belongs to that type on which the effect of the sea operates to regularise the shoreline, and there is consequently no room for harbours until the littoral belt of the Landes comes to an end.

**The Charente Country.**—Lying within the two-fold influence of the Central Massif and the Atlantic, the two departments of the Charente offer types of scenery by no means common in Aquitaine. What the map shows us is a low platform of Cretaceous limestones and marls, dropping gently seawards, and only lightly etched by little valleys that are often dry. The landscape which meets the traveller's gaze is monotonous, but not devoid of charm. It in no way resembles the Causses: the water lies always close to the surface; there are meadows along the valleys, and patches of woodland shut out the distant view, but there is always a village within sight.

These "warm lands," contrasting with the "cold lands" of Marche and the *brandes* on the ancient granite alluvium, became at an early date the abode of

man. The mild, moist climate, impregnated with the breath of the ocean, permits the cultivation of every kind of crop. Markets, now active little towns like Angouleme, Cognac and Saintes, prospered on the Charente, while harbours grew up behind the large islands that protect the coast. A spirit of trade and enterprise seems to have penetrated to the very heart of the country districts.

To an ever-increasing degree cereals are yielding ground to the vine and fodder-crops. The vine-stocks, planted in long belts on the hills that border the Charente, yield grapes that are principally used to make brandies of renown. The fodder-crops and the meadowlands combined give facilities for the fattening of the stock bought at the fairs of Limousin, or promote the production of milk, which is mainly in the hands of large co-operative societies.

Easy conditions prevail in all the country districts. Large fortunes are hidden in the towns behind the modest exteriors of ancestral residences. The old paper-making industry survives in Angouleme. Rochefort and La Rochelle struggle against conditions which do not favour the development of a modern port; the former exports wines and brandies, the latter with its ship-yards serves as a port of refuge for the navy.

**The Molasse Districts.**—Aquitaine proper may be said to begin with the Tertiary formations, among which the exposure of the molasse is the most important. It would be hard to conceive anything more uniform and monotonous than the landscape over all this rolling countryside. For more than a hundred miles, from Bergerac to Villeneuve-sur-Lot and from Albi to Castres or Castelnaudary, we find the same succession ot

rounded eminences and little valleys, of small woods and fields of maize and wheat, the same villages and the same *hordes*, or solitary farms. Local names may differ, but the scenery and the rural economy hardly change. Here and there the outcrop of a bed of limestone may produce a white cornice or form a little arid *causse*. The Agout is confined in a miniature canon near Castres. But these are merely local features. The creep of the soil, which always contains a larger or smaller admixture of clay, rounds off every angle. In this region, though it cannot be called flat, the only approach to a steep slope is to be found on the sides of the main valleys, and there patches of woodland may still be found, unless the ground is occupied by vines.

The monotony of the landscape is most striking in the lower basins of the Tarn and the Agout, or in the Lauraguais of Castclnaudary. The districts round Albi and Castres are more verdant, for there little forests have been preserved and there are hedgerow trees beside the roads. Maize is the principal crop and together with the fodder-crops and the meadows makes stock-raising a profitable occupation. Solitary farms are dotted everywhere, but village centres of population are comparatively scanty. Country towns, on the other hand, are numerous and old-established. Vigorous local communities developed, which the ravages of religious wars failed to stifle. On the ruins of the cities where the leaders of the Albigensian heretics dwelt, the *Bastides* were planted, recognisable to-day by the regularity of their plan. Along the valley of the Agout, industrial life is gradually spreading. Castres has now become a markedly more active town than Albi, which slumbers in the shade ot its beautiful cathedral.

Lauraguais is drier and barer than any other region on the molasse. The disafforestation of its rolling uplands has reduced the landscape to one of utter desolation. Farms have practically disappeared, but there are large villages hidden in folds of the ground, or perched on some hill from which the prospect is extensive. The insecurity of this region, which runs to the head of the Naurouze Gap, encouraged the concentration of the population, and the violent winds which sweep the uplands have been a contributory cause of the disappearance of the trees. At the present day Castelnaudary is the only town which can be said to show any signs of activity.

**Lannemezan and Armagnac.**—The influence of the Pyrenees is supreme in the districts that lie within the curve of the Garonne. One cannot fail to be struck by the fanwise arrangement of the streams; it seems as though one were watching the surface drainage running off an immense fan of alluvial soil, washed down from the Pyrenees. The debris of the mountains does, as a matter of fact, cap all the summits from Lannemezan to Armagnac, but the rivers have nearly everywhere excavated down to the molasse. The valleys he in such close proximity to one another as to leave in many cases nothing but a narrow ridge between (Fig. 20).

The process of excavation has been facilitated by the abundant precipitation induced by the Pyrenees. According to Fabre,* the asymmetrical profile of the valleys is due to squalls of wind from the west, lashing those sides of the valleys which are turned to meet them. At any rate, this asymmetry is one of the most striking features of the landscape. The road from Toulouse to

*L A Fabre, "Le sol de ia Gascogne," *La Geographic* Vol xi (1905).

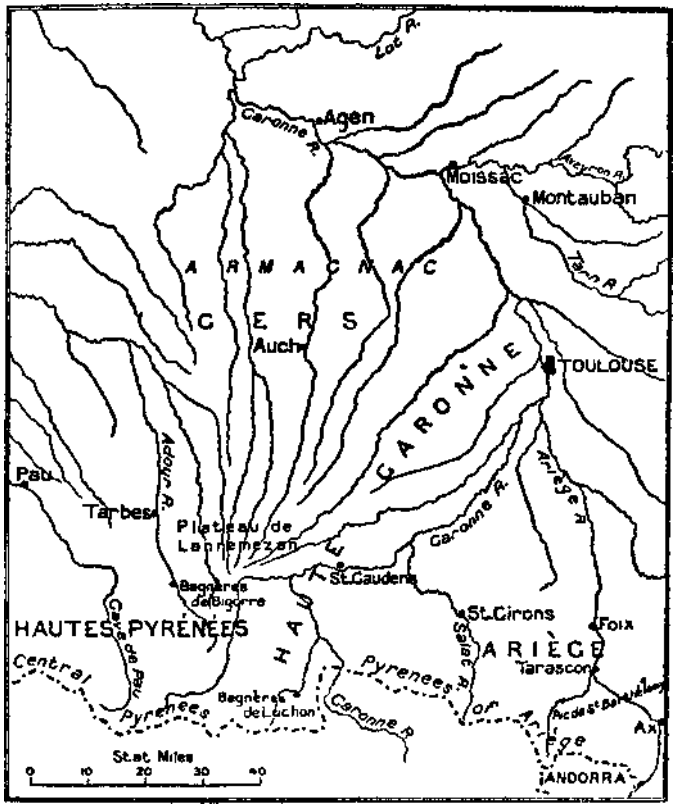


FIG 20
RIVERS OF LANNEMEZAN AND ARMAGNAC

Tarbes is remarkable for the bewildering series of sudden drops and comparatively gentle climbs which succeed each other at intervals of a few miles Every valley you come to shows the same contrast between a steep, wooded eastern wall and a western slope covered with

arable fields and groups of houses. In no part of Aquitaine is the relief so varied, but the endless repetition of the same variation only results in monotony again (Fig. 21).

The valleys are more deeply trenched near the Pyrenees and leave between them belts of tablelands of considerable elevation, whose wind-swept and often snow-covered surface has little to show but moorland. The sheep on their way to their mountain pastures in summer make a prolonged halt at this level. The bottoms of the broadest valleys grow valuable crops, and there towns have sprung up to serve as markets for the mountain regions—Tarbes and Bagneres-de-Bigorre.


FIG. 21
ASYMMETRICAL VALLEYS OF LANNEMEZAN
Vertical scale exaggerated.

The tableland drops to a lower level in Armagnac. The climate is milder, and greater areas are under cultivation. The scattered arrangement of the houses is again noticeable here. A landlord will often occupy one of his own farms. This is the country of the *"cadets de Gascogne"* a fertile country of cereals and fruit crops. Vineyards are taking up more and more of the ground, and the wines produced are in many places made into brandy, for which Armagnac has long been as celebrated

as Cognac. But the country districts are losing their population, which follows the line of least resistance in the direction of the towns, while the birth-rate fails to fill the resulting gaps.

**The Landes.**—No part of Aquitaine is so completely under the influence of the Atlantic, nowhere does the monotony of the scenery become so absolutely an obsession, as in the region called the *Landes*. The railway may run for sixty miles without a curve across the plain, and what you saw for the first quarter of an hour you will see to the end of the journey. Slender pine-trees, heaths with here and there a marsh, at rare intervals a sheep-farm, and at intervals still rarer a village surrounded by fruit-trees. A hundred and fifty years ago the scenery was more monotonous and dreary still, and the name "Landes" represented with even greater justice the prevailing landscape.

The whole of this plain consists of fine sand, blown onward by the wind wherever it is exposed. If you go to the seaside, you will see the sand piled in enormous dunes, whose summits glitter in the sunlight 250 feet above the waves. It has been proved that this sand is not all of marine origin, for it is associated with the terraces of the Garonne and represents in the main the last ruins of the Pyrenees. But the winds from the sea have spread it over this vast area. Inland, the only elevations are those of ancient dunes, formed when the climate was drier.

It is most probable that the first arrivals in this region found the surface soil in most places permanent. But even in its natural condition it is not healthy. The rainfall due to the proximity of the sea and the Pyrenees is twice as heavy as it is in Paris. It sinks into the sand and

forms a subterranean water-table, which must drain away with extreme slowness in the absence of any fall in the land to help it. At the level at which this water-surface lies a crust of sand has formed, solidified by a dark red ferruginous cement, which is called *alios.* Wherever this " iron-pan" runs continuously, no tree-roots can penetrate, and the water lies stagnant on the surface.

For centuries, the *Landes* were nothing but a desert. Their human occupants sought the more hospital coastal region, where the lagoons, formed by sandbars at the mouths of the little rivers, were full of fish, and the little valleys lay snug between the dunes. There the vegetation is almost Mediterranean in character, and evergreen shrubs grow side by side, with the common oak *(Q. pedunculata).* But the clearing of the forest proved fatal to the soil, and the end of the Middle Ages saw the shifting sands driven inland by the on-shore gales and swallowing up the villages.

In the eighteenth century, Bremontier discovered the means to anchor the dunes and remedy, at the same time, the poverty of the inland districts. Hurdle-work and the planting of grasses with running roots check the rapid initial movement of the sands above high-water mark, and pine-trees, clumps of which grew here and there among the inland heaths and marshes, are now systematically planted everywhere, especially on the landward side of the coastal dunes. The results have been nothing short of amazing.

The waves still break at the foot of the great dunes of Arcachon, but a sea of verdure now overflows their landward face, and extends as far as the eye can see. The villages lie in shelter. Inland, sheep have become rarer, and fewer shepherds traverse the marshes on their

stilts, but rational management of the pine forest brings wealth to the villages. The trunks are scored with gashes, and little vessels hung below them to collect the resin; but this is not the only use to which the trees are put. The plantings, systematically thinned and renewed, are an inexhaustible source of pit-props, beams and paving-blocks. In some places, the draining of the marshes has even made it possible to form meadows and raise stock. Since the population is no larger, while the income has increased tenfold, the parishes of the Landes are some of the most prosperous in France.

Thus we see how a rational adaptation of human activity to the soil has worked a transformation in the maritime region of Aquitaine.

**The Garonne.**—We have still to make acquaintance with the most seductive scenery in Aquitaine, the scenery we meet in the Garonne valley, from the mountains to the sea. Even the traveller who merely follows this great thoroughfare by road or rail from Bordeaux to Toulouse will remember it as an earthly Paradise. Few indeed are the regions in the south-west that will bear comparison. Vines and fruit-trees share the steep slopes of the valley; its floor is a broad expanse of arable fields; the villages lie close to one another, and every dozen miles we find another town. It is a fair country, lit by a bright and ardent sun, and its whole atmosphere conveys a sense of ease and plenty. The southern speech seems to come more briskly from the lips of the fellow-travellers who join or leave the train at every station. But these are no new discoveries: foreigners have made them in every age. This is the secret of the fascination that Aquitaine exercised upon the English, who held the

country for hundreds of years. From the Middle Ages, indeed from Roman times, this corridor with its full and eager life has enjoyed peculiar esteem.

Nature designed it when she established the course of the Garonne on the very axis of the Naurouze Gap, which leads to the Mediterranean. The erosion of the Pyrenees, whose debris still cumber the Garonne, sent down during the Pleistocene period enormous masses of detritus, which is now deposited in terraces all along the river and enters the lower courses of its principal tributaries. Level surfaces are frequent, and there agriculture, highroads and villages find a refuge from the floods and a soil that is easy to work.

Toulouse itself lies in a landscape of such terraces, for their development on a large scale begins at Saint Gaudens. The highest, which are at the same time the oldest and the driest, are edged with scattered woods. Fields of cereals lie in long belts on the lower terraces, and there the vines are trained on trees as in the plain of Lombardy. A close network of roads connects farm with farm. The villages and towns are to be found upon the river banks, which rise high above the level of the stream.

Toulouse lies at the fork of the road to the Pyrenees and the route to the Mediterranean *via* the Gap of Naurouze. The wharves of the Canal du Midi which has united the two seas since the eighteenth century, have contributed to the prosperity of the town, but since the construction of the railway, the importance of the water-way has diminished. A town of art and eloquence, rich in memorials and accustomed to take rank as the capital of the district, Toulouse, with her 180,770 inhabitants, is still, next to Bordeaux, the largest town

in the south-west of France. Besides her general trade and agricultural industries, she manufactures chemicals **and** engages in metallurgical activities, making extensive use of electricity for the purpose.

After the Garonne has made its bend to the north-west, the lower terraces are formed at the expense of the upper ones and invade the valleys of its tributaries. At Moissac, the valley, confined between hills of limestone-capped molasse, becomes comparatively narrow, but it widens again at Agen. The two basins thus defined rival one another in fertility and richness. In both you find the same delicious fruit, the same tender wheat, the same sleek cattle. Perhaps the cereals are a more important crop round Montauban. In that district the *hordes*, with their pigeon cotes and their open barns—a mere roof supported on pillars—are scattered more widely. Round Agen, the villages are more concentrated, and there the vine plays the principal part. But in either direction there is the same swarm of old towns. All of them are prosperous, but none rises above the rank of a local market-town with flourishing agricultural industries.

**Bordeaux** (267,000 inhabitants) is the only large town on the lower Garonne. It steadily absorbs the energies of the district, uniting as it does the advantages of an estuarine port and a wine-growing centre of world-wide celebrity.

The importance of the vineyards of Bordeaux depends less on the volume than on the quality of its products. Among the wine-growing departments of France, Gironde takes only third place, but the wines of Bordeaux have been famous for hundreds of years. They are exported to all parts of Europe, and mainly to England,

at prices which compare with those of burgundies, or even of champagnes. Bordeaux is the commercial centre for the whole of the Garonne valley and the lower Dordogne.

This commerce has always furnished a considerable part of the merchandise handled by the port. It had as much to do with the choice of a site for the harbour, and consequently with the position of the town, as the narrowing of the river, which makes it easier to cross at this point than lower down, or its depth, which is great enough to allow ships to come up on the tide. The building of the quays, which were extended in the course of the nineteenth century over a distance of three miles, the construction of the tidal basin with its two locks, the dredging operations, which maintain a depth of thirteen feet in the approach channel—a depth which is at least doubled at spring-tides, the increased facilities for handling cargoes—all these improvements have followed the progress of the traffic of the port, which exceeded four million tons in 1913. The need for out-ports, however, nearer the open sea is none the less evident. During the war they played an important part, and the whole estuary of the Gironde resembled an immense roadstead, with shipping of every size moored in long open lines.

In the topography of the harbour and the town itself, the influence of the natural conditions is still observable. The bridge which fixed the position of the earliest assemblage of houses, hinders the upstream development of the harbour. The greot bend of the river brought boats to the concave bank, where the water was deeper. The quays, therefore, were naturally built on this side, and their majestic sweep is one of the beauties of the town. On this side, too, the town developed in concentric

circles, with the nucleus of old historic quarters and the busy streets lying close to the middle of the curve. On the opposite bank, shipyards, railway-stations and factories came at a later date to cover wide areas. This functional divergence between the two banks of the river is likely to persist for many years to come; it is an essential feature in the appearance of Bordeaux (Fig. 22).

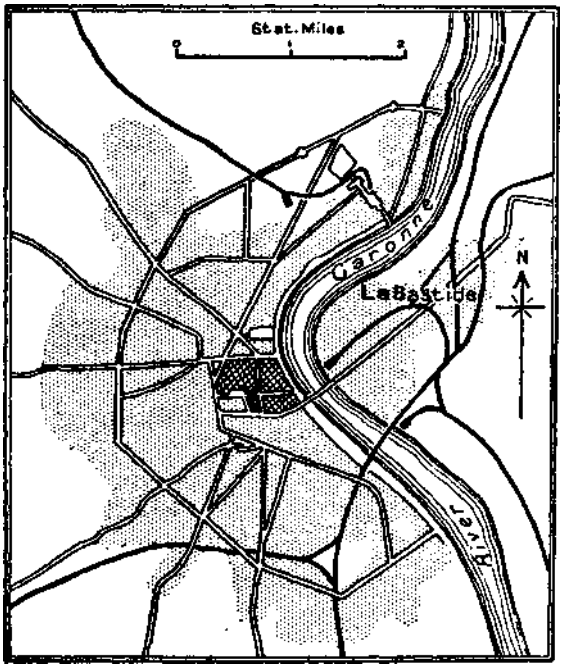


**FIG. 21**
**GROWTH OF BORDEAUX**
**Old town cross-hatched; modern extensions stippled.**

# CHAPTER XVI

## THE PYRENEES

FROM the distance of Toulouse, the Pyrenees appear on the skyline, a solid, lofty rampart with just a fringe of snow upon it in summer. That is the aspect they present from every part of southern Aquitaine. They are the most massive and unbroken barrier on any frontier of France. The slightly serrated crest-line scarcely suggests a range of like nature with the Alps, and it is indeed a little lower, though it has peaks of over 10,000 feet. The cols in the ridges are not so deeply cut; the peaks do not stand out so clearly. The valleys on the French side are deep and short, and end in nearly every case in a *cul-de-sac* without giving access to a broad longitudinal corridor. Communication is difficult in every direction, and traffic limited.

Nevertheless, both in their structure and their age, the Pyrenees are definitely an Alpine chain. It would be easier to recognise them as such on the Spanish side, where longitudinal valleys do exist. Even on the French side geologists have long distinguished zones running parallel to the axis of the range, and the progress of tectonic research has revealed structural complications, which are interpreted, as in the Alps, by overfolding. In reality, the French side is the steep face of a mountain fold-system, which occupies the whole of northern Spain. The fall between the axis of the crest-line and the plain was probably always sufficiently pronounced to ensure

that the rivers draining the French side should dominate those occupying the longitudinal trenches The uplifting process, which began in Eocene times before that of the Alps, has been several times repeated without alteration in character. Isolated one from the other, each valley of the Pyrenees forms a little district of its own and establishes relations more readily with the plain than with its next neighbour. The connection of the Pyrenees with Aquitaine is very much more intimate in all respects than that of the Pre-Alps themselves with the Alpine foreland.

In addition to the difficulties which the relief causes to longitudinal intercourse, there are others due to the orientation of the range and the consequent climatic divergences. The difference between the Western Pyrenees exposed to the breezes of the Atlantic and the Eastern Pyrenees looking out on the Mediterranean is so great that the geographer Strabo, on the strength of the information he received with regard to their appearance and products, thought it necessary to assign a north and south direction to the whole range. The Basque mountains, with their forests of oak and ash, their scattered farms and cloudy skies, strongly remind one of Brittany, while high up the rugged slopes of the Alberes and the Corbieres the olive grows, and with it those oaks whose leaves are always green; and the same brilliant sun shines on the lofty plain of Capcir and on the vineyards of Roussillon.

The altitude of their peaks and passes and the orientation of their valleys are other points in which the Eastern Pyrenees differ from the Western. But the .contrast between east and west is by no means the only one: the central portion of the range differs from either extremity

in its more massive relief and its deeper valleys, which bear the imprint of the ice. This is the most Alpine section of the Pyrenees (Fig. 23).

### THE WESTERN PYRENEES

The department of the Lower Pyrenees, which corresponds fairly closely to the Western Pyrenees, is well named. The highest summits scarcely rise above 6,500 feet, and though the precipitation is remarkably heavy (forty-six to sixty inches), eternal snows are unknown. Cols at heights of about 3,250 feet present no special difficulties to communications; in fact, the range is nowhere less formidable as a barrier than in this section. For all that, it makes a profound impression upon the traveller who arrives at Biarritz, or Saint Jean de Luz, fresh from a journey across the monotonous expanses of the Landes. Such bold silhouettes as that of La Rhune, for instance, will receive more than a casual glance. From the Basque platform, fretted by the Atlantic waves, the rise is sudden and the slopes are steep.

The view from any eminence is striking. The wide expanse of hummocky uplands and the uniform height of the crest-lines, contrasting with the depth and narrowness of the valleys, impress the beholder. He sees a mass of complicated structure, reduced in some former age to the condition of a peneplane, undergoing another violent onslaught of the agents of erosion. Upreared on the edge of the Atlantic, the mountains are lashed by the squalls of the north-westerly gales. Moreover, the gradual disappearance of the magnificent forests is contributing to make the scour of the torrents more effective. The green shoots of the ashes are continually being lopped to feed

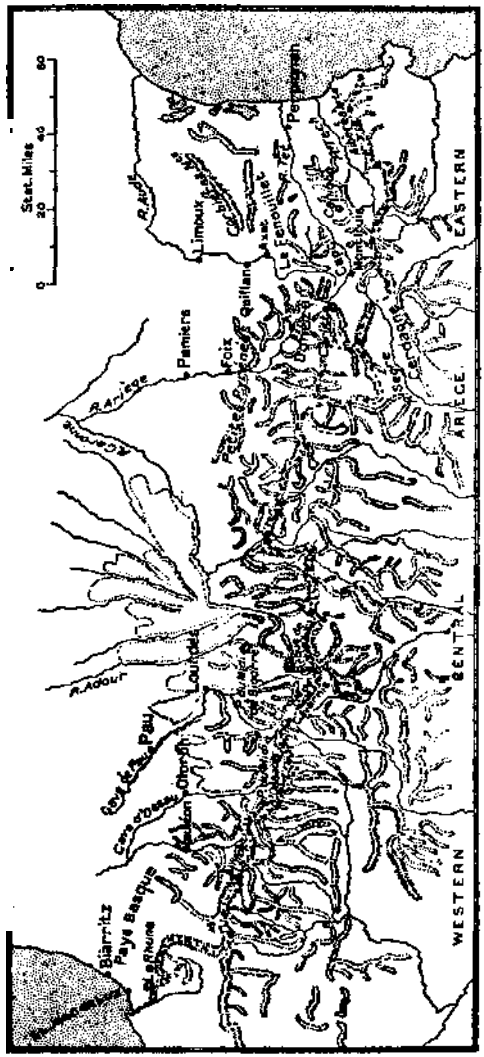


FIG. 23
THE FOUR DIVISIONS OF THE PYRENEES
(The Cirques of Gavarnie and Troumouse lie north of the frontier)

the cattle, leaving a sorry spectacle of half-withered pollards with the bracken growing thickly under them, quite powerless to hold the soil. At the bottom of the gorges, where the trees surfer no such indignity, they show astonishing vigour. A fantastic adornment of creeper-covered trees clings to the scarps of the limestone canons, and sometimes they meet across an abyss whose overhanging walls almost roof it in.

This country has been for many hundreds of years the home of a race of mountaineers, very jealous of their individuality. Everything about the Basques is a peculiar heritage: the physical type, the language, which has no known affinities to any of the European families, certain details of their costume which they still retain, their customs, their games, like *pelota,* even their pastoral life. The frontier which divides the Basque country into two has led to smuggling, which plays as important a part in their economy as stock-raising and agriculture. The proximity of the Atlantic has promoted the spirit of adventure, but, though he emigrates readily, the Basque generally returns to his own country in the end.

As we travel eastward from the sea, we note a progressive alteration in the characteristics of the country. The mountains no longer soar in one single sweep; folded hills of Cretaceous age extend as far as the Gave de Pau. The passage to the loftier, more massive and structurally more complex Central Pyrenees is roughly indicated by the deep notch of the Ossau valley.

### THE CENTRAL PYRENEES

The department of the Upper Pyrenees is no less appropriately named than that of the Lower Pyrenees.

Here the crest-line, which the frontier follows, is higher and more unbroken than elsewhere. Cols below 8,000 feet are rare. From the Ossau Pic du Midi to the source of the Garonne, there is not a valley that does not end in a *cul-de-sac* under snow-clad peaks 10,000 feet in height. The glaciers scarcely attain the dimensions of those which rank as second class in the Alps. For the most part they are glittering ice-caps, crowning some massive bastion or emphasizing a shelf on the flank of some scarp, or else mere *nfofc* lying in the hollow of a cirque. But real rivers of ice filled the valleys to the limits of the mountains in the Pleistocene period, and left their mark on them much as they did in the Alps.

The *basilica* and holy city of Lourdes grew up in a typical moraine landscape. The Bigorre Pic du Midi is an outpost of the mountains, rising to 9,440 feet. From its summit two different landscapes are revealed: on the one hand, the broad expanse of the ancient gravels of Lannemezan, resembling the "cold lands" of Dauphiny; on the other, the yawning valleys whose excavation yielded the masses of detritus transported by the *Gaves.* All the mountain-crests are hollowed into cirques, in which pockets of snow lie unmelted till midsummer. The mountain sides are at first extraordinarily steep, but the slope becomes gentler half-way down. Flatter benches appear, with a few hamlets or lonely chalets perched upon them. Progress up the valleys is impeded by shelves of rock, reminding one of the bars across the Alpine valleys. Here, as there, they are pierced by wild gorges, which the ancient roads avoided. Finally you reach an amphitheatre like the famous Cirque de Gavarnie or the still grander Cirque de Troumouse.

On all the roads that skirt the mountain torrents, the

wayfarer has almost a sense of suffocation. Hardly a single tributary breaches the towering walls above you; every valley is a narrow trench shut off from the world outside. Settlement rarely penetrates beyond the green cavities which lie between the Jurassic and the Cretaceous folds on the outer edge of the mountains. A Pyrenean *commune* is a scattered group of farms and little hamlets, all lying between the same ridges. Fields of cereals, irrigated meadows bordered by poplars, gardens and orchards, make life easy there. Further up among the mountains we find nothing but poverty-stricken hamlets, whose flocks and herds browse on the upland pastures all the summer.

## THE PYRENEES OF ARllsGE

Horizons grow wider, the structure of the mountains more complicated, east of the Garonne. The map shows a network of corridors running, in certain sections, parallel to the main axis of the range. Side valleys present themselves to the traveller on his way up the main valleys. As you climb the Pic Saint Barthelemy, a mountain on the outskirts of the range, you see the long corridor in which the Ariege runs from Ax to Tarascon. From the lower end of it, an easy col leads into the valley of the Salat, a tributary of the Garonne.

The mountain fold-system is broader at this point; the drop from the peaks to the plain is less pronounced. Erosion is attacking zones of folding more definite in character, and adapting itself to their structure. The Little Pyrenees, consisting of folds as regular in appearance as those of the Jura, rise in advance of the main

range, and their straight, wooded ridges contrast with the softer relief of the molasse. The real mountains begin at Foix, a picturesque old town that guards the *cluse* in the first limestone barrier. In the compressed folds of the Jurassic and Cretaceous strata erosion has emphasized the limestone ridges and deepened the depressions between the high whale-backed hills of more or less metamorphosed Archaean schists. Here again we find the *communes* isolated in the verdant hollows. The pastures that lie above the forest on high, rolling platforms resembling the uplands of the Vosges are dotted with barns and alive in summer with the sheep that arrive each season from the Pamiers district.

The population is concentrated in the longitudinal trench of the Ariege. A chain of little basins has been scoured by erosion in the marly limestones of the Jurassic and Cretaceous series. The range here is lower than in the Upper Pyrenees, and the glaciers never extended much further than this. They left behind them moraines and terraces adapted for human settlement. The *Arihge* is here not more than 2,000 feet above the sea, and the climate is drier and sunnier than in the Pre-Pyrenean ranges, which form a barrier to the rain-clouds. The Atlantic is far away, and the consequences of that remoteness are perceptible, particularly when the south-east wind blows over the *cols* of Donezan and breathes warmth and dryness through the land. The mountain-sides that face the south, the *soula,* remind us that we are nearing the Mediterranean. Clumps of evergreen-oak, box and lavender form a sparse *garrigue* on the sun-scorched limestone rocks, and vines, almonds and fig-trees stand in rows upon terraces supported by walls of dry stone. In many parts a forest growth of beech and

spruce still clothes the slopes on the *ubac*, or shady side, and attains a greater altitude than in the Upper Pyrenees themselves

Men were attracted to this region at an early date. They found no lack of sites in which to settle: alluvial terraces, where now long roads and furrows run; sunny slopes that favour fruit-growing; steep crags on which they set a walled village or a castle to protect the valley; fine forests that still secure large incomes to the *communes.* Mineral wealth they found as well: the working of the iron ore at Tarascon gave rise to a metallurgical industry which still survives.

Beside this rich and busy zone, the great mountains where the frontier runs seem dreary and devoid of charm. They lack even the picturesqueness of the snowy peaks of the Upper Pyrenees. Their heavy, rounded granite summits have only a scanty fringe of cirques. Disafforestation, accelerated by the dryness of the climate, has helped the rain-wash to scour gullies in the slopes. The snow disappears early from the cols, and for centuries the sheep from the plains have crossed them in their seasonal migrations to the mountains. The continuance of the practice, even in time of war, was secured as early as the fourteenth century by treaties of "covenanted entry" *(Traites de lie et passerie).* In this custom of transhumance, we note another sign of the proximity of the Mediterranean world, to which the Eastern Pyrenees definitely belong.

## THE EASTERN PYRENEES

In every respect, the Eastern Pyrenees are a region apart: in their orographical structure and climate, their

vegetation and their human life. New influences are apparent, some of which only were dimly recognisable in the Pyrenees of Ariege.

On the map, the parallel arrangement of the country is immediately obvious, but far from following even approximately the axis of the range, the natural divisions run almost at right angles to it. The plain of Roussillon opens like a great bay between the Corbieres and the Alberes and is prolonged by the valleys of the Tet and the Tech, till it buries itself among the mountains in a south-westerly direction. If you ascend the rugged valley of the Tet, where the villages are perched on craggy pinnacles, you come out quite unexpectedly into a bright and fertile plain, a Roussillon of the mountains, as it were. In the gorges of Cerdagne lying at your feet the Spanish Segre rises near the ancient citadel of Mont Louis, some 5,000 feet above the sea.

The broad hollow of Roussillon, with its continuation in the trench of the Tet and the Segre, is connected with the foundering in recent times of the Mediterranean deeps. Capcir, the next neighbour of the high plain of Cerdagne, hangs in a similar bowl-like manner over the gorges of the Aude. The straight walls that shut it in suggest that a subsidence has at some time taken place. In most parts of the Eastern Pyrenees these raised bowls or basins recur, an indication of the fracturing of a massive mountain block. Above the basins and the gorges thiough which their waters pour down to the plains you find hummocky uplands or tablelands. Limestone tablelands covered with magnificent forests surmount the fantastic canon of the Aude; the rounded eminences of Carlitte look down on Capcir and Cerdagne, broad expanses of moorland and marshy or lake-filled

hollows intersected by rocky ridges a bare thousand feet in height. Even the highest summits seem to belong to surfaces that have suffered long erosion in the past, and to owe their present altitude to movements of no very distant date.

To see limestone ridges that clearly correspond to the east-west folds, and the Fenouillet syncline in the schists along the southern edge of the Corbteres, we must go down the Aude as far as Quillan.

The orographical structure of the Eastern Pyrenees owes its peculiar features to the earth-movements that accompanied the formation of the western Mediterranean. But the influence of the inland sea is no less marked in the climate. The same bright skies, the same burning sun and dry atmosphere are to be found all the way from the coastal plains to the upper basins and from the gorges of the Aude to the summits of Carlitte.

One cannot imagine anything more rugged or more desolate than the naked ridges of the Corbteres, where forest fires and grazing have destroyed the Mediterranean *tnaquis.* The Alberes, whose crests of schist or granite run out to the coast, are adorned with fine forests of evergreen-oak, which yield a good supply of timber. Vines are grown on terraces supported by dwarf walls, and the luscious grapes they bear produce the sweet, highly alcoholic wines to which Banyuls has given its name.

The Mediterranean vegetation also penetrates the gorges of the Aude as high as Quillan. But the alternate beds of schist and limestone cause springs to abound. In the shade of the *ubacs* broad-leaved trees grow splendidly; the olive and the fruit trees seek the *soulas* and the limestone slopes. The little towns, like Quillan

and Axat, lie ensconced in the trenches of the schist, while on the tablelands there are great forests of magnificent beeches.

The sun-baked plain of Roussillon owes everything to the streams that flow down from the mountains and keep the ground moist, though to no great depth, even when they disappear from view. Labourers in field and vineyard always lift up their eyes in gratitude to the mountain-tops, for there the clouds are stayed, and there the sun slowly melts the fostering snows. The pyramid-shaped Canigou owes its legendary prestige as much to the white cap that covers it till summer comes as to the remarkable boldness of its lines. Every part of the plain that rises appreciably above the level of the water-table and the reach of irrigation is a desert; it is the *aspre,* where the land is worthless. But wherever the irrigation channels can be led, there, according to the degree of moisture, vineyards will prosper, or cereals, fodder-crops or market gardens, and sometimes meadowland. As in Languedoc, the area under vines is steadily extending in the plain, and there the cottages are scattered in a manner that suggests a centrifugal movement of the population. In reality the normal tendency is towards concentration, though Perpignan is the only town of any size.

Between the lower valleys or the coastal plains on the one hand and the mountain basins on the other, there is not invariably an uninhabited area, despite the wildness of the gorges which connect the two. The canon of the Aude between the town of Axat and the Capcir district is deserted, but the valley of the Tet is thronged with villages clinging to its steep sides and often perched on the summit of an apparently inaccessible crag,

with vines and chestnut plantations on narrow terraces upheld by walls of stone.

Existence, however, on the high plains of Capcir and Cerdagne seems more attractive. At those altitudes the clear sky pours down both light and warmth. In the gardens of Osseja the pear-trees yield luscious fruit destined to adorn the tables of expensive Paris restaurants. In winter the snow comes down to Mont Louis, but it never hes for long. The keen, dry air has all the quality of the most renowned health resorts. One thing only is necessary here as elsewhere—water. Above the road that skirts the irrigation canal there always lies the *aspre*, a stony desert; below it, the luxuriant foliage of the fruit trees, the verdure of meadows strewn with flowers. The villages lie thick on the border of the plain, where the water comes out of the valleys of Carlitte.

On the mountain sides the forest grows up to 8,000 or sometimes even 9,000 feet. The puny pines you find at the tree-limit in the Alps grow under this bright sky into vigorous trees resembling the stone pine in appearance. It would seem that even the highest peaks are beyond the reach of the Atlantic breezes. Only a few patches of snow outlast the summer beside the tarns of Carlitte. The glaciers that existed here in the Pleistocene period hardly extended beyond the high plains of Capcir and Cerdagne.

For all their differences of structure, the Eastern Pyrenees cannot be separated from the rest of the range that runs from the Atlantic to the Mediterranean, and forms the most obvious natural frontier that France possesses.

A characteristic common to the whole range is its

influence on the plains extending to the north of it. Examples have already been given, but we may add the formation of that chain of towns from one sea to the other which marks the line of contact of the mountains and the plain. Their number is to be explained by the independence of the separate valleys, another general feature of the Pyrenees. Their importance varies more or less with that of these valleys themselves. It is usually greater in the case of towns lying at some distance from the actual foot of the mountains, such as have grown up at the crossing-places of a number of roads. Compared with mere local market-centres like Mauleon, Oloron, Lourdes, Foix and Limoux, places like Pau and Perpignan appear quite important towns. Toulouse itself is from many points of view a city of the Pyrenees.

# EXPLANATORY INDEX

**Names of *Departments* are given in italics, sometimes abbreviated; e g. *B.* = *Bas* or *Basses, H.* — *Haut, Mos.* = *Moselle.* After a river-name, r = rises, ent = enters, r.b. = right bank, 1 b = left bank, inh. = inhabitants, dist. = district *(pays),* h. pk. or pt. = highest point, q.v. *(which see)* refers to the *last* word preceding these letters.**

**A few pronunciations are roughly indicated in** [SMALL CAPITALS].

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