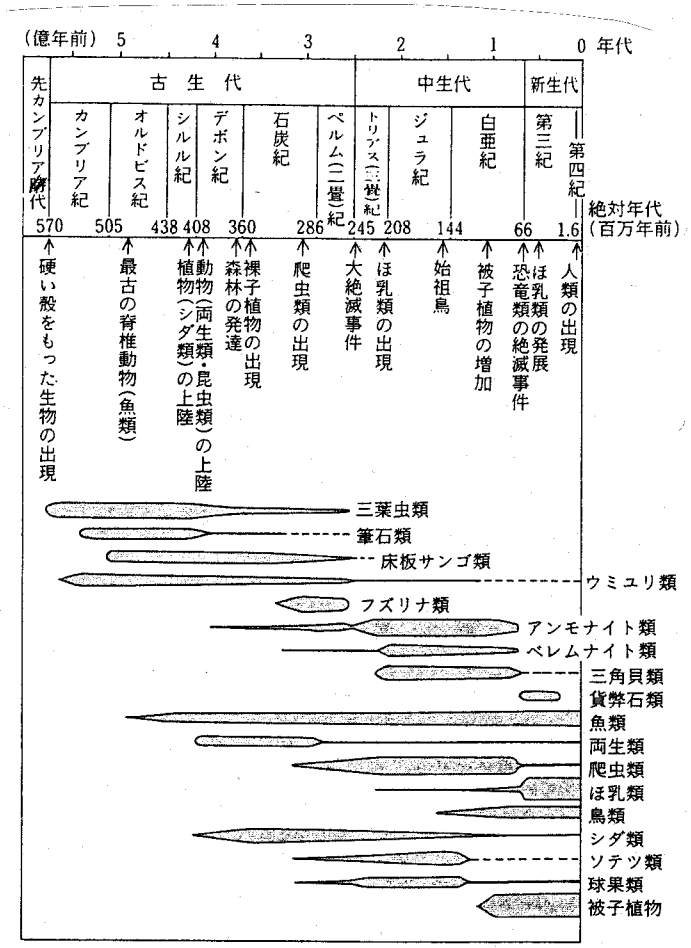


地質時代の区分と生物の歴史．地質時代の区分が生物進化に基づいて行われていることがわかる

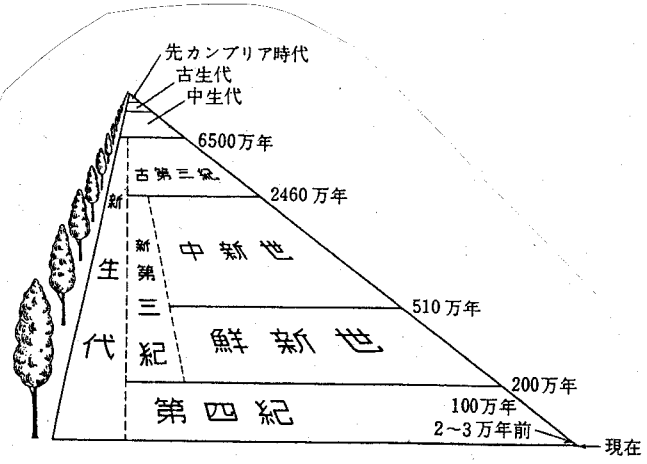


図 17.2　地球の歴史の目盛の入った道路を過去に向って眺めた透視図．このように理解するとよい('大地の動きをさぐる')

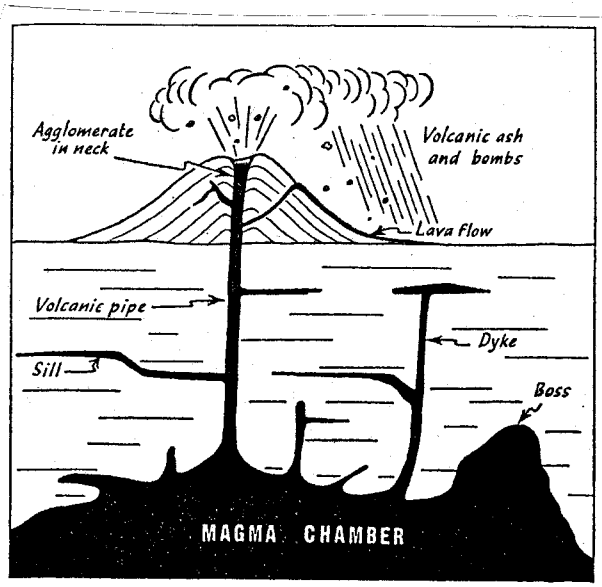


FIG. 1
Forms of igneous intrusions and extrusions.

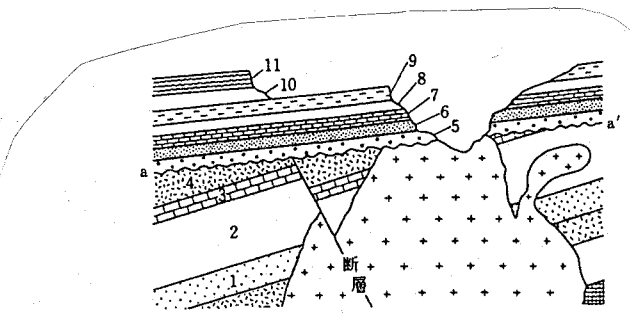


図 17.4　地殻運動を記録した地質断面図[6]．一連の地層(1-4)の堆積後，この地域では，地層の傾動と火成岩の貫入，断層の生成，初期の地層と火成岩の削剝があり，その後，ふたたび一連の地層(5-11)が堆積した．a-a' は不整合面

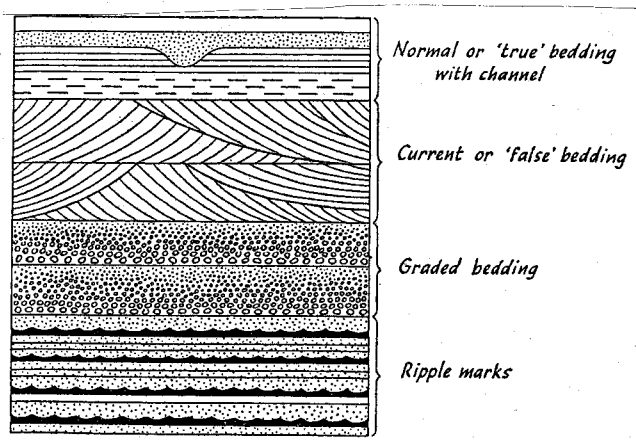
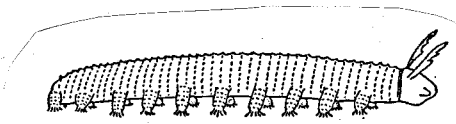
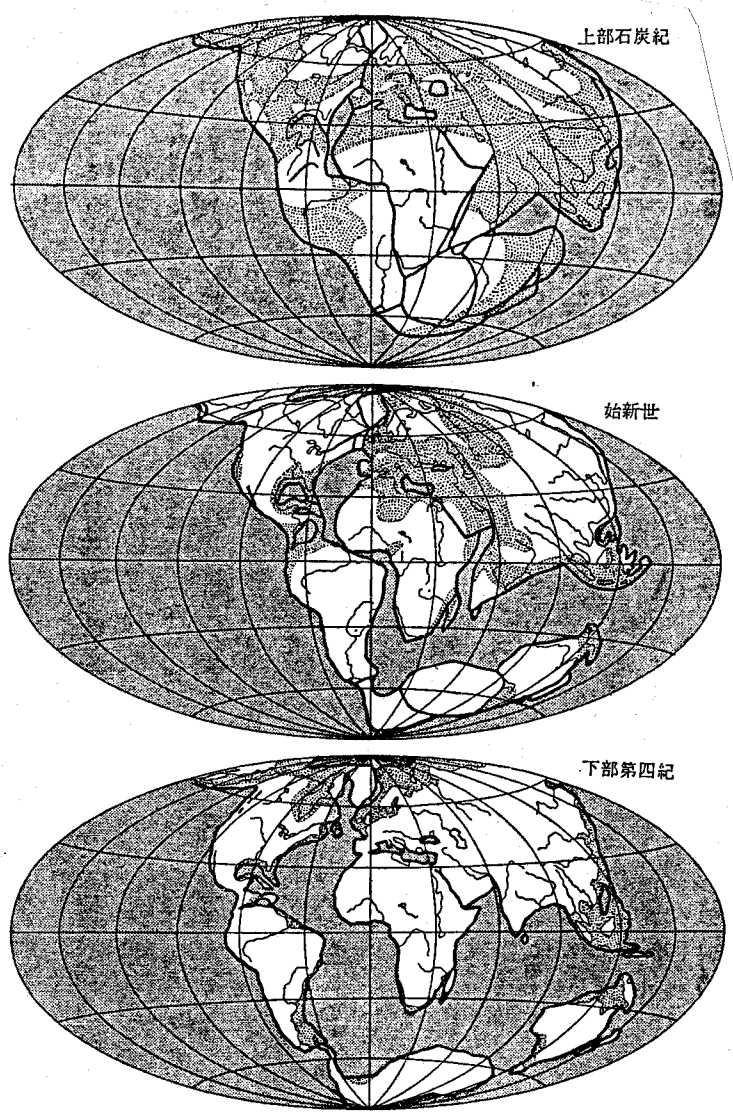


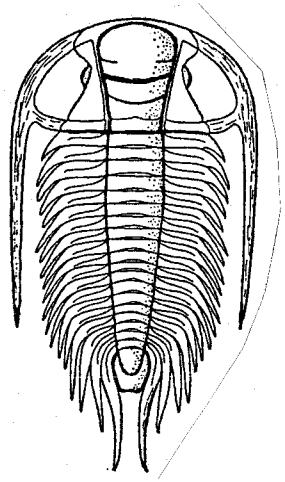
FIG. 7
Types of bedding in sedimentary rocks. Note the tendency of the 'false' bedding to be concave upwards, the graded bedding to become finer grained upwards and the ripple marks to be more angular upwards. These criteria are not completely dependable, but false bedding particularly is very useful in determining the order in which beds were originally deposited.

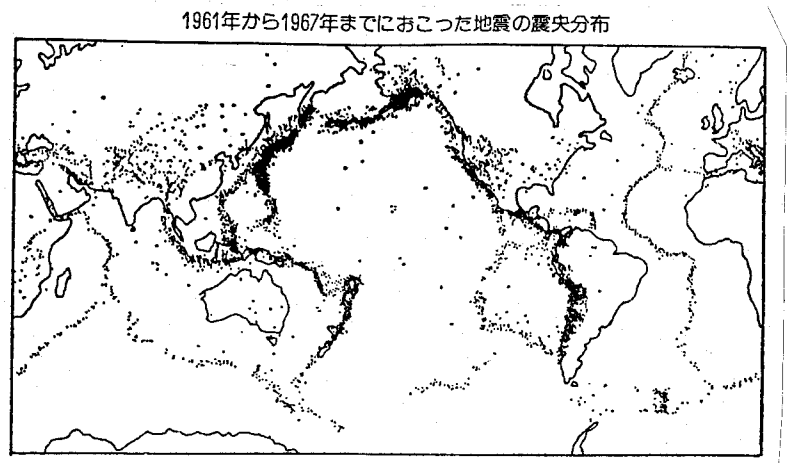




アミ点が海洋を、砂点が浅い海を示す。現在の海岸線と川をそえたのは、現在の地図との対応を明らかにするためである。地図に描かれた緯度経度の線は、任意的なものである。現在のアフリカを基準の地域としている（これについては第八章を参照せよ）

第4図　大陸移動説による三つの地質時代に対する再構成図





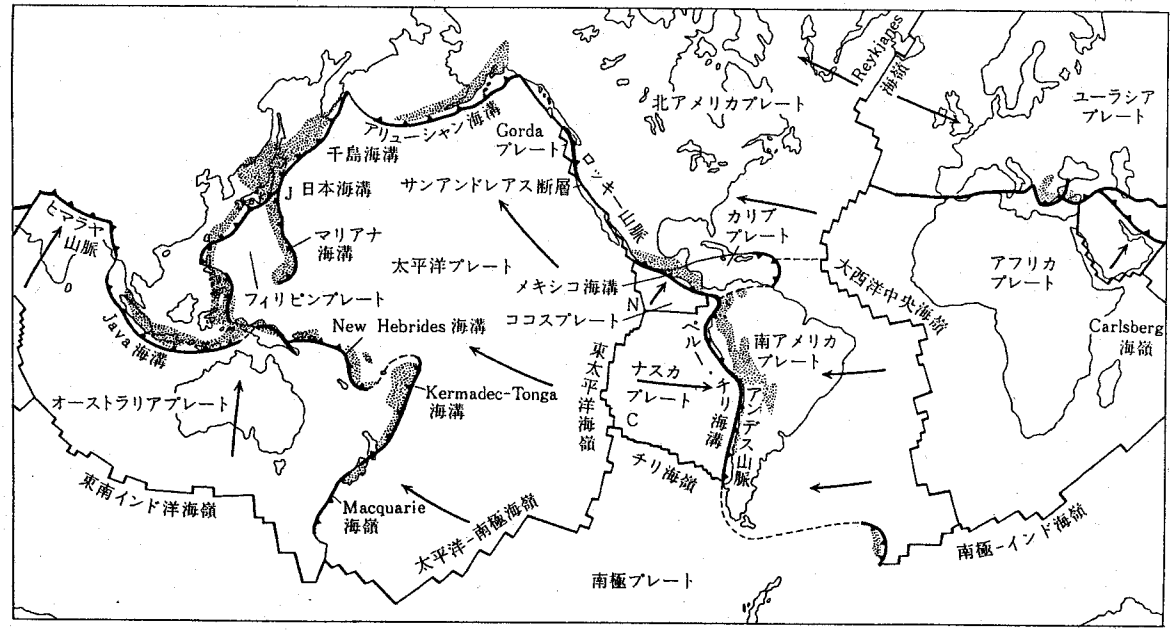
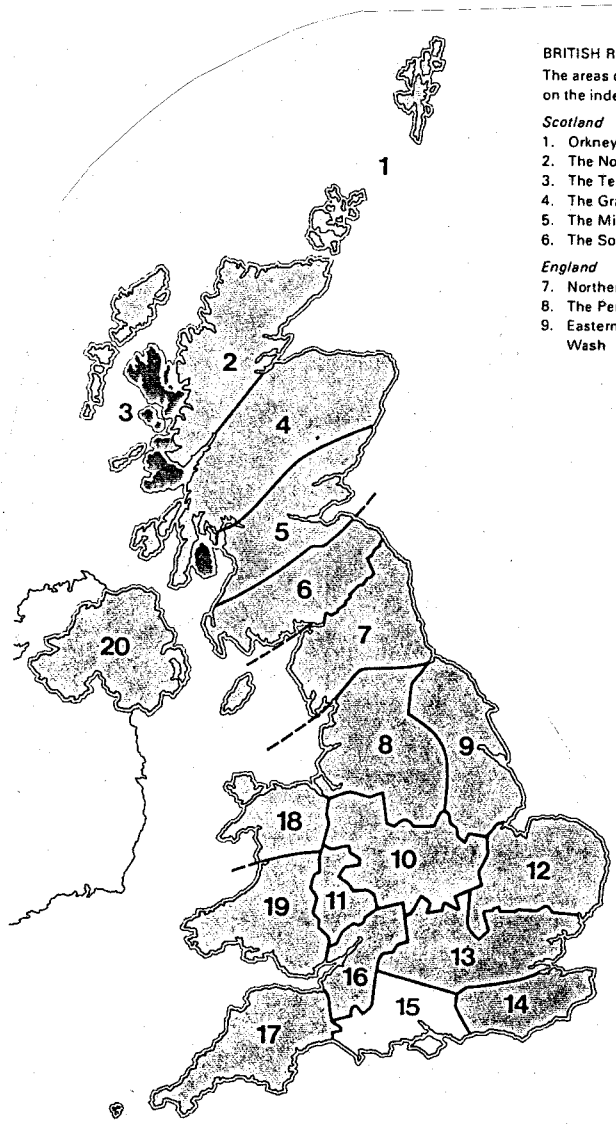


図21.2　世界のプレート分布(Dewey, 1972による)[1]．アフリカを不動としたときの各プレートの運動を矢印で示した



BRITISH REGIONAL GEOLOGY

The areas covered by each title are shown on the index map

Scotland

1. Orkney and Shetland
2. The Northern Highlands
3. The Tertiary Volcanic Districts
4. The Grampian Highlands
5. The Midland Valley
6. The South of Scotland

England

7. Northern England
8. The Pennines and adjacent areas
9. Eastern England from the Tees to The Wash
10. Central England
11. The Welsh Borderland
12. East Anglia and adjoining areas
13. London and the Thames Valley
14. The Wealden District
15. The Hampshire Basin and adjoining areas
16. Bristol and Gloucester District
17. South-West England

Wales

18. North Wales
19. South Wales

Not part of the British Regional Geology series

20 Regional Geology of Northern Ireland

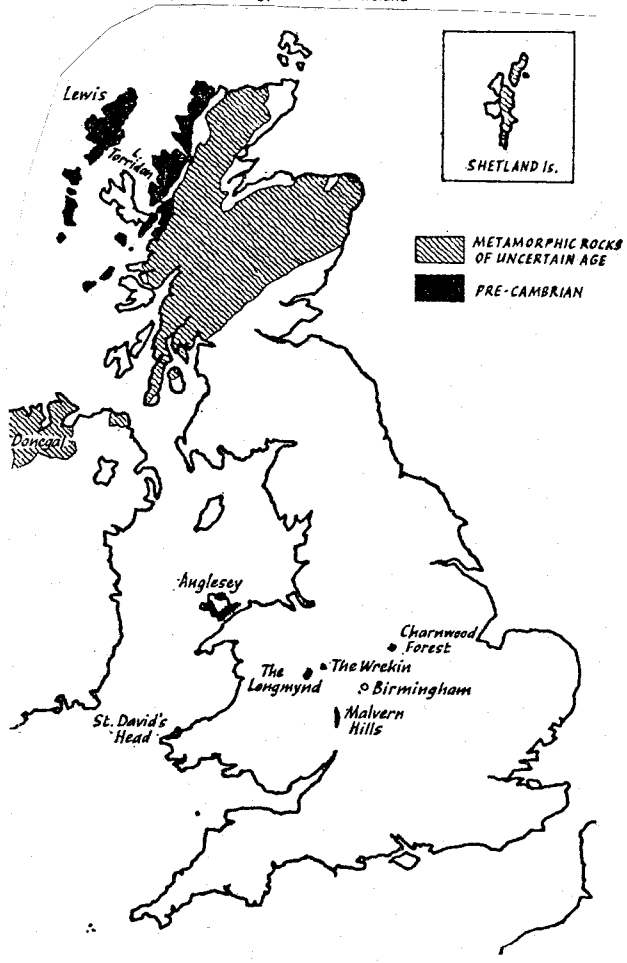
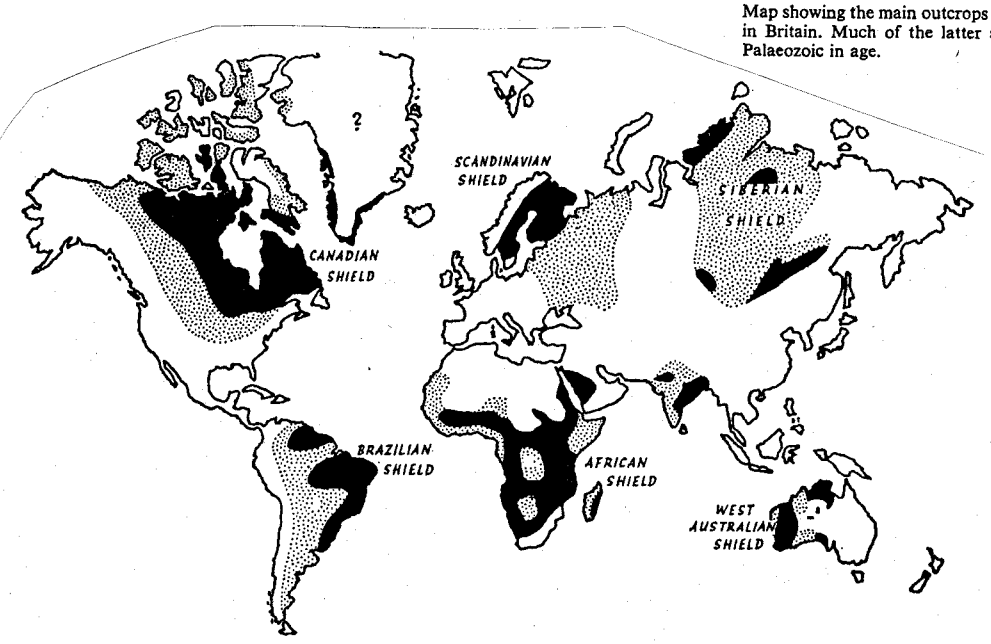


FIG. 6

Map showing the main outcrops of Precambrian and possible Precambrian rocks in Britain. Much of the latter are now known to be almost certainly Lower Palaeozoic in age.



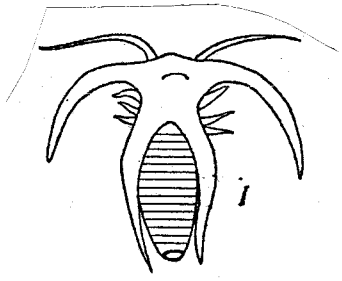


FIG. 8

Simplified map showing the shield areas of the world. Large regions in which Precambrian metamorphic rocks are exposed at the surface are shown in black; platform areas, in which these rocks are buried at shallow depths beneath unfolded sediments, are shown stippled.

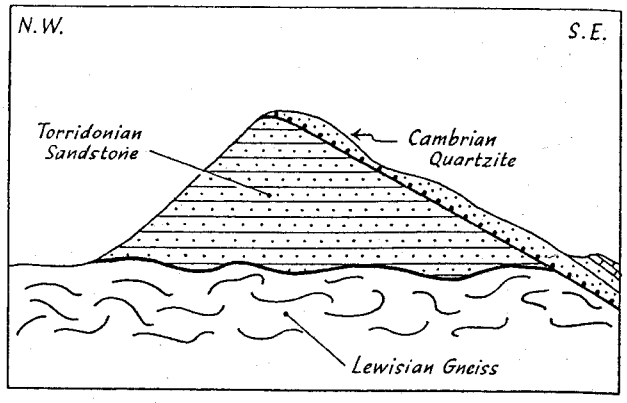


FIG. 9

Simplified cross-section of Canisp in Sutherland, showing the Cambrian beds (on the right) resting on Torridonian and Lewisian rocks of the Precambrian.

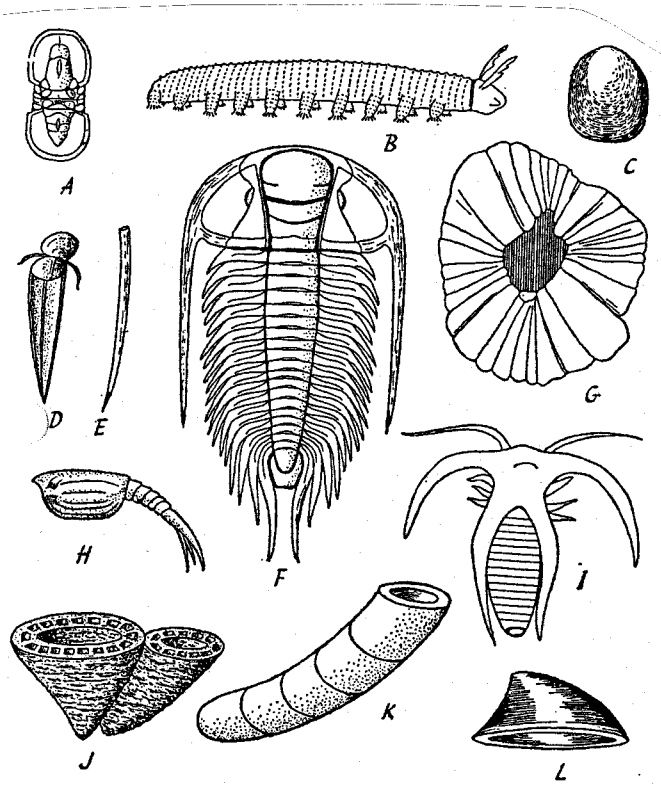


FIG. 10

Cambrian fossils. *A*: small blind trilobite, × 3½; *B*: reconstruction of a worm-like creature from the Burgess Shale (after Walcott), × 1⅓; *C*: simple horny brachiopod, × ⅔; *D* and *E*: members of an extinct group, possibly related to the molluscs, both × 1; *F*: large spiny trilobite, × ½; *G*: jelly-fish from the Burgess Shale (after Walcott), × ⅔; *H*: crustacean distantly related to the lobsters, × ⅔; *I*: aberrant crustacean from the Burgess Shale (after Walcott), × 2; *J*: extinct group with points in common with both the sponges and the corals, × ⅔; *K*: early cephalopod mollusc, × 1½; *L*: early marine gastropod mollusc or 'snail', × 2. The magnifications given for these and later drawings of fossils are only approximate.

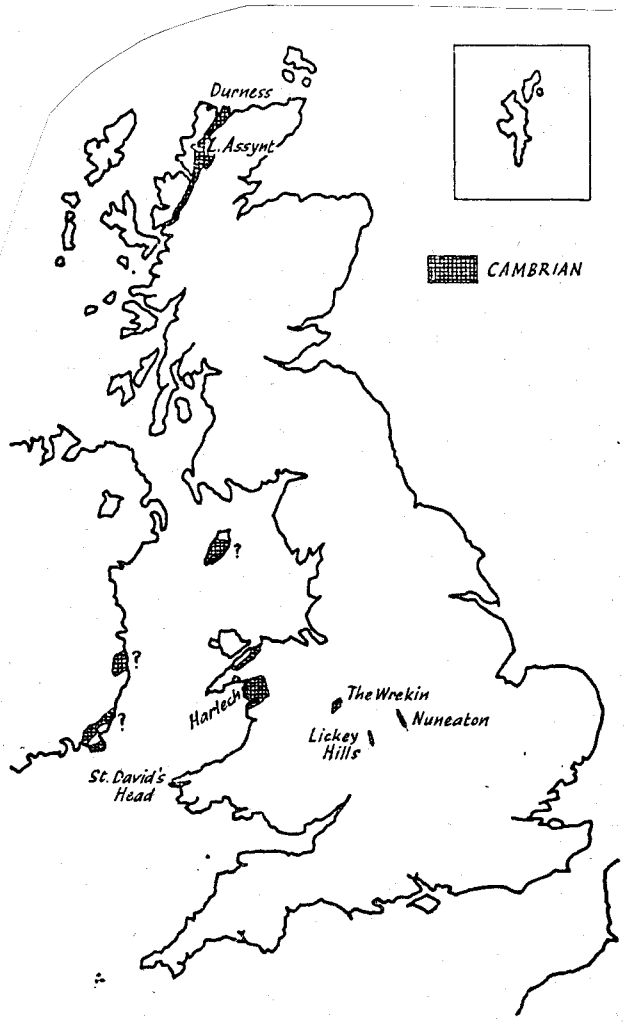


FIG. 11

Map showing the main outcrops of Cambrian rocks in Britain. The Cambrian age of the outcrops shown in south-east Ireland and the Isle of Man has not yet been proved.

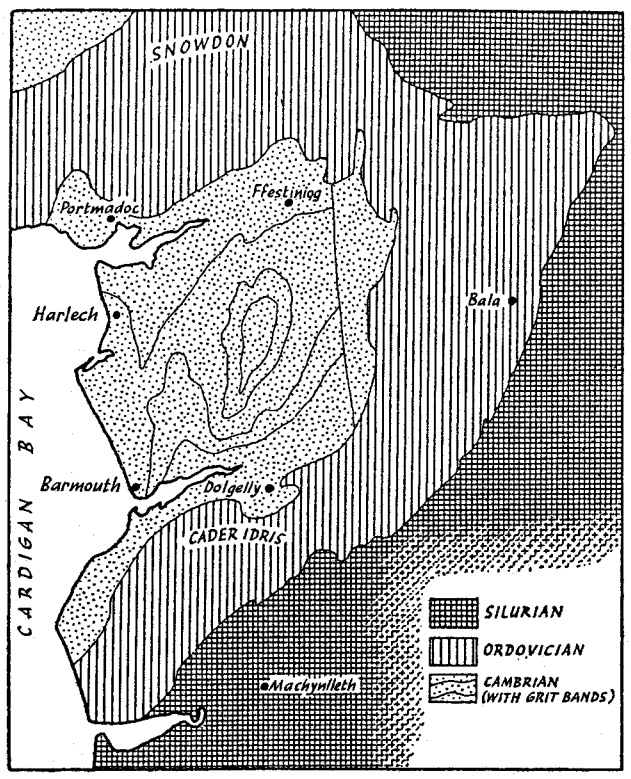


FIG. 12

Geological sketch-map of part of North Wales, showing the Harlech Dome and surrounding areas (simplified from various sources).

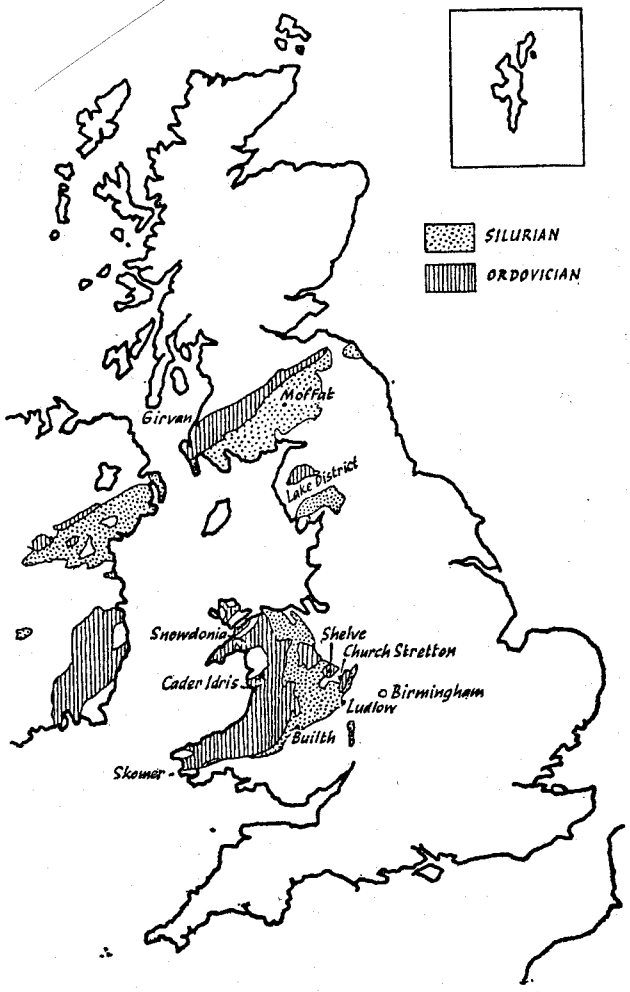


FIG. 13
Map showing main outcrops of Ordovician and Silurian rocks in Britain.

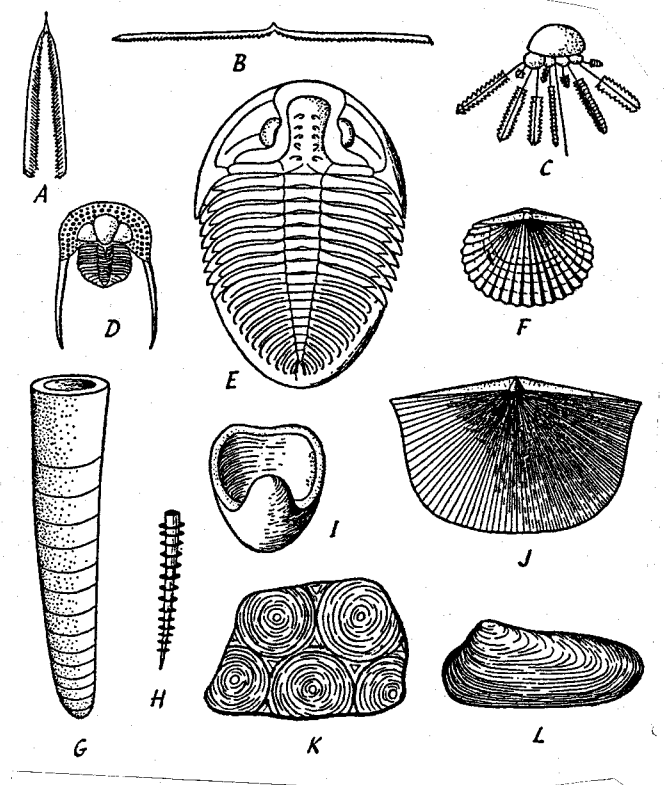


FIG. 14
Ordovician fossils. *A*, *B* and *C*: different kinds of graptolites, *A* × 1, *B* × ¾, *C* showing several graptolite colonies attached to a float (after Ruedemann) × ½; *D* and *E*: trilobites, showing the characteristic trilobed appearance of the skeleton, *D* × ¾, *E* × ⅔; *F* and *J*: brachiopods with calcareous shells, both × 1; *G*: nautiloid cephalopod with straight shell, × 1; *H*: member of an extinct group, possibly related to the molluscs, × 1; *I*: marine snail or gastropod, × 1½; *K*: rock formed by lime-secreting algae, × ½; *L*: bivalved mollusc or lamellibranch, × 1½.

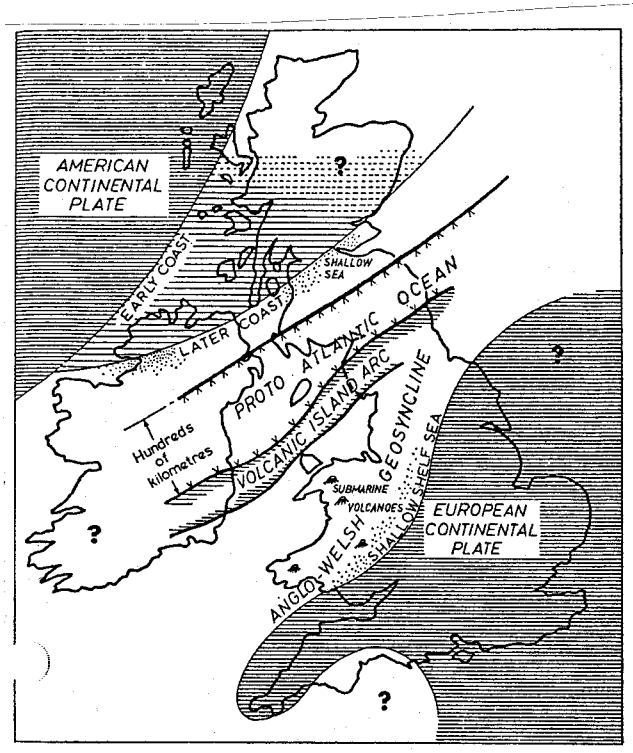


FIG. 15
Reconstruction of the supposed geography of Ordovician times.

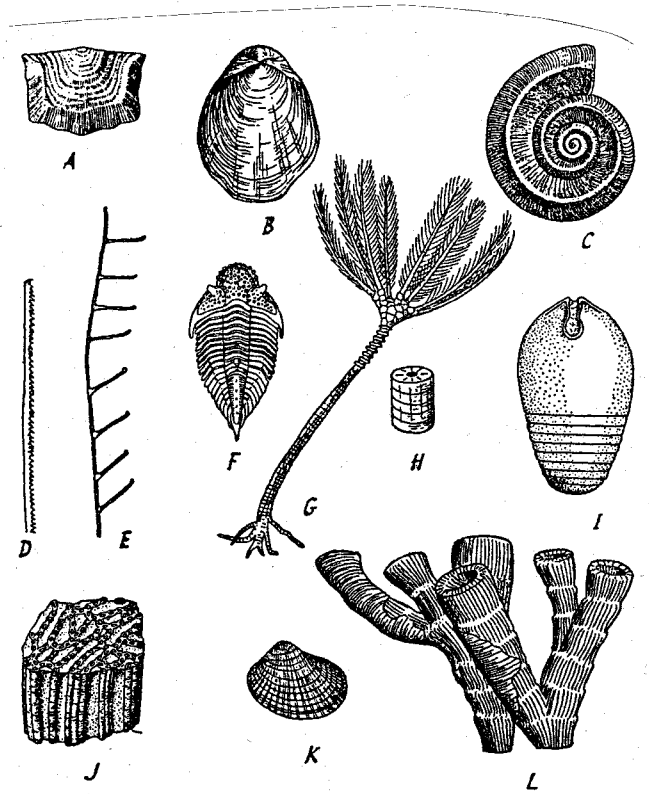


FIG. 17
Silurian fossils. *A* and *B*: brachiopods, both × ¾; *C*: marine snail or gastropod, × ½; *D* and *E*: graptolites, *D* × 1, *E* × ¾; *F*: trilobite, × ¾; *G*: crinoid or 'sea-lily' showing 'roots', stem, cup and arms, × ½; *H*: segments of crinoid stem, × 1; *I*: aberrant nautiloid mollusc (after Zittel), × ¾; *J*: compound coral, × ¾; *K*: bivalved mollusc or lamellibranch, × ¾; *L*: branching compound coral, × 1 (*A*, *D*, *E*, *F*, *J* and *K* after Institute of Geological Sciences figures).

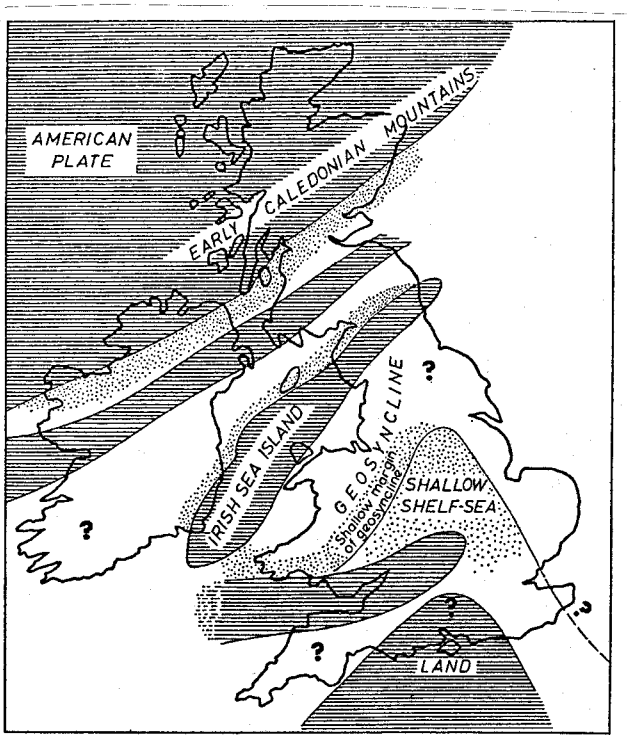


FIG. 19
Reconstruction of the supposed geography of Silurian times (after Wills and others).

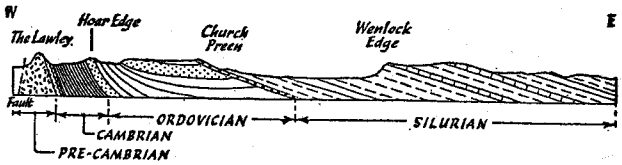


FIG. 18
Cross-section of the Lower Palaeozoic country in East Shropshire (from a section on the Shrewsbury map of the Institute of Geological Sciences).

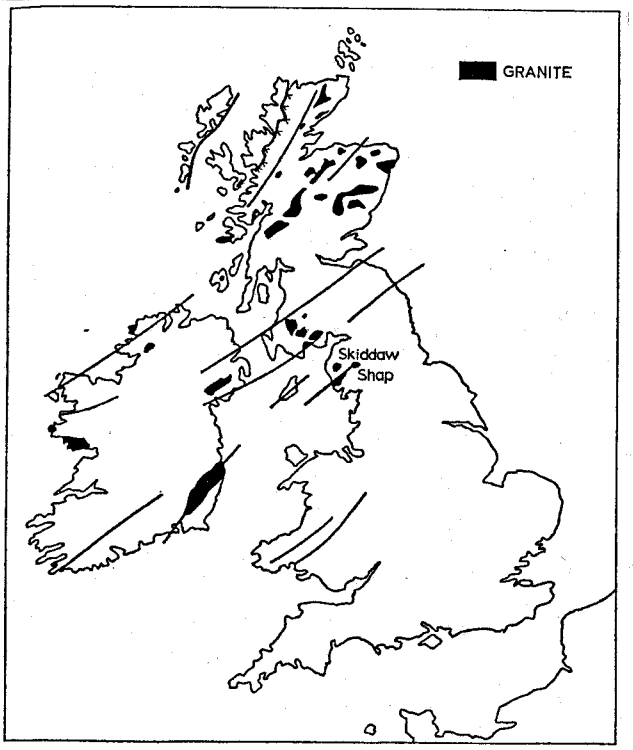


FIG. 20
Map showing the main trends of Caledonian folding in Britain, with some of the granite masses emplaced at this time.

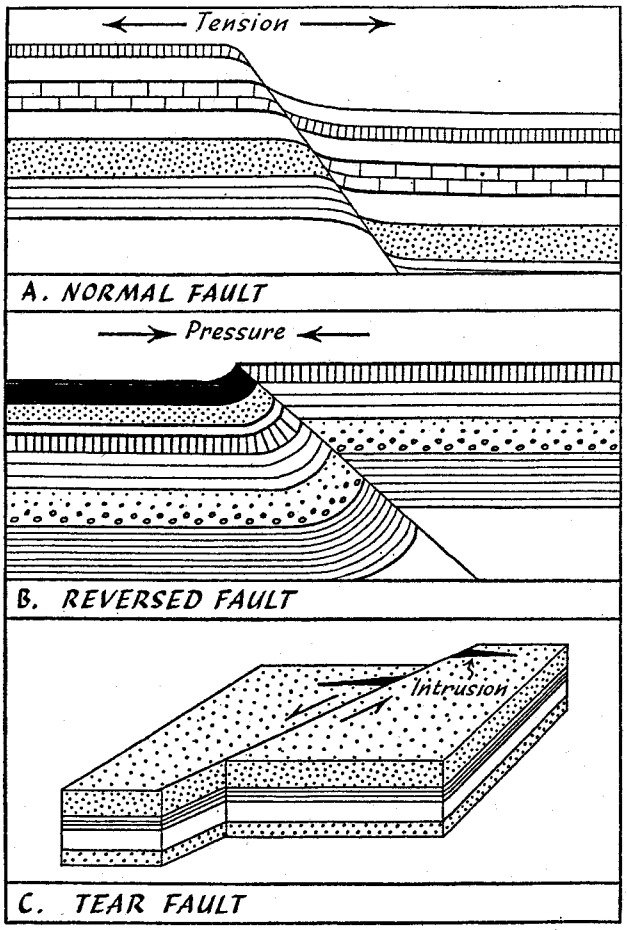


FIG. 22
Different types of fault.

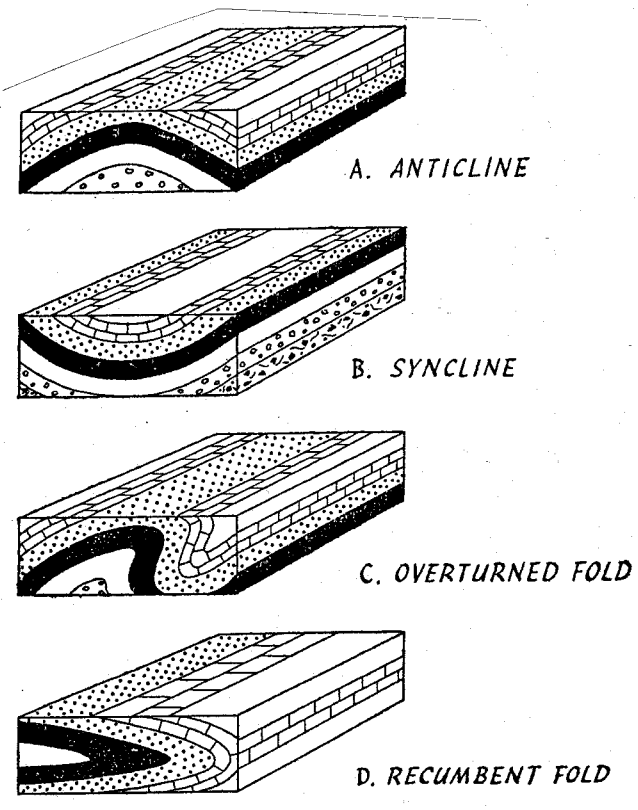


FIG. 21
Different types of fold.

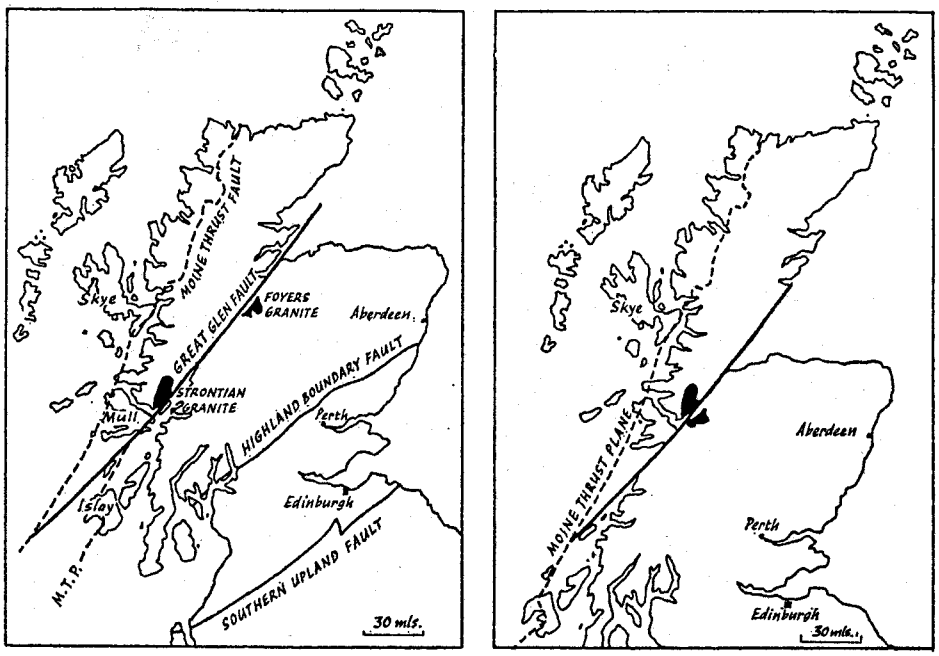


FIG. 23

The major faults of Scotland. *Left:* The major thrusts and faults of Scotland as they are at the present day. *Right:* The position of the present land areas as they are thought to have been before the movement of the Great Glen fault. Note the position of the two granite masses and the displacement of the Moine Thrust plane (based on Professor Kennedy's maps, by kind permission of the author and the Council of the Institute of Geological Sciences). There is now evidence that the Great Glen fault also moved in the opposite direction.

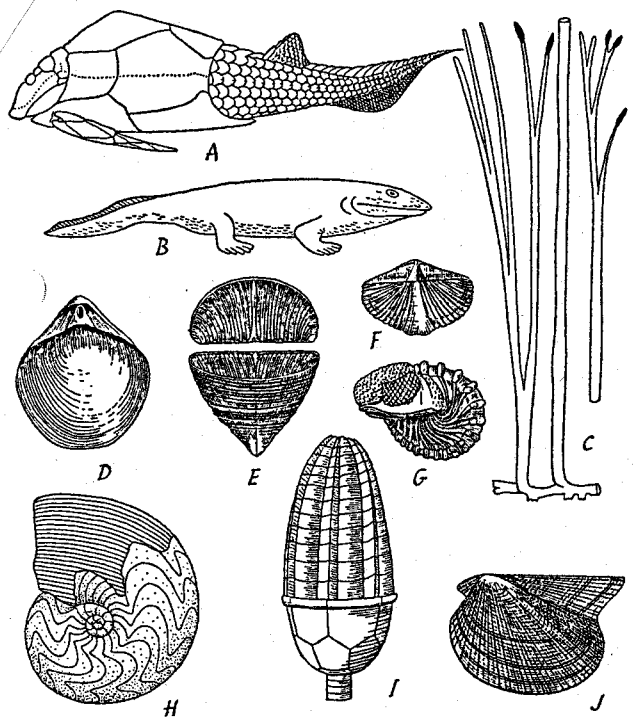


FIG. 24

Devonian fossils. *A*: primitive, heavily-armoured fish (after Watson), × ½; *B*: reconstruction of a primitive amphibian showing fish-like tail (this form may possibly be early Carboniferous in age), × $\frac{1}{10}$; *C*: primitive land plants from the Rhynie Chert (after Kidston and Lang), × ½; *D* and *F*: brachiopods from the marine facies, both × ½; *E*: simple coral with lid, × ½; *G*: trilobite in rolled-up position, × ¾; *H*: early ammonoid or goniatite with shell worn away showing internal partitions, × ½; *I*: cup and arms of a crinoid, × ½; *J*: bivalved mollusc or lamellibranch, × ½.

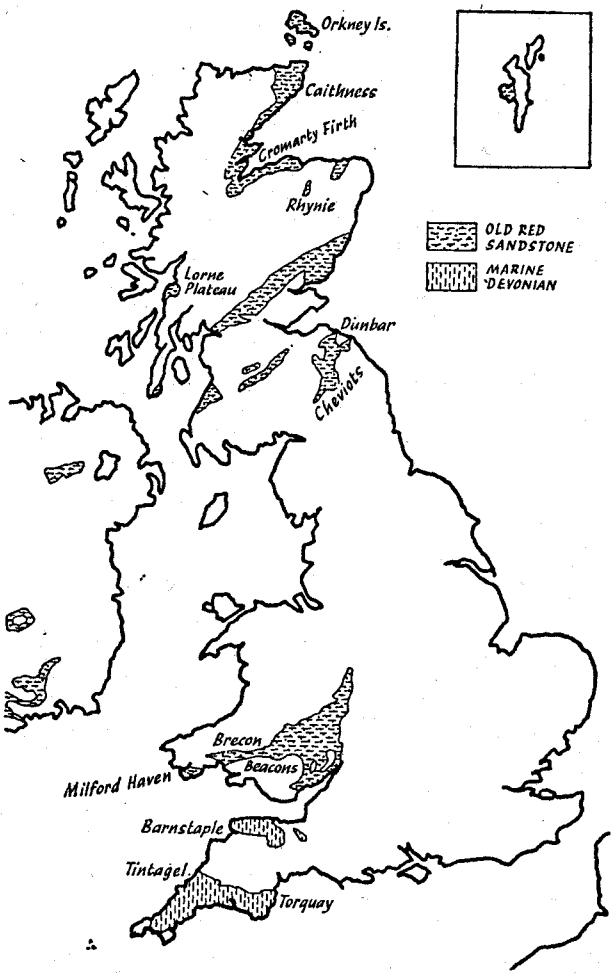


FIG. 25

Map showing the main outcrops of Devonian rocks in Britain.

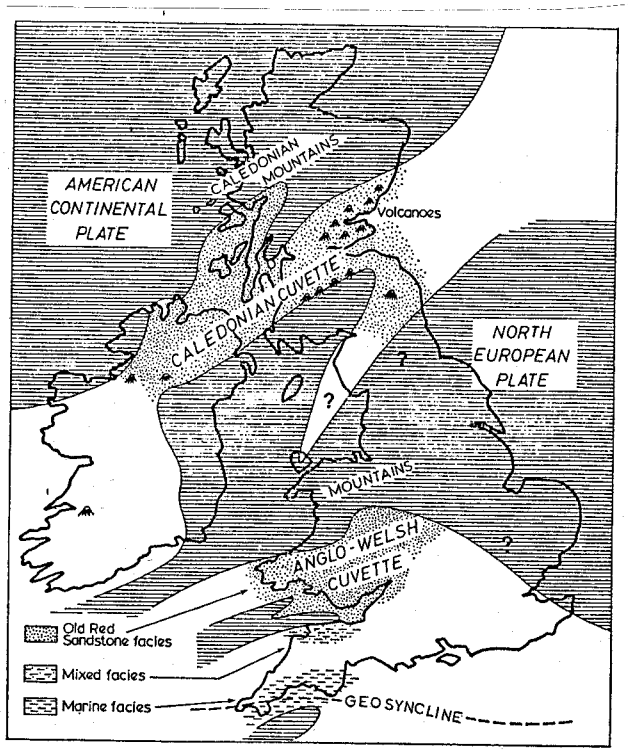


FIG. 26

Reconstruction of the supposed geography of early Devonian times (simplified from *A Palaeogeographical Atlas of the British Isles* . . . by L. J. Wills, by kind permission of the author and Messrs. Blackie & Son, Ltd.). The north Scotland or *Orcadian* cuvette did not come into existence until later.

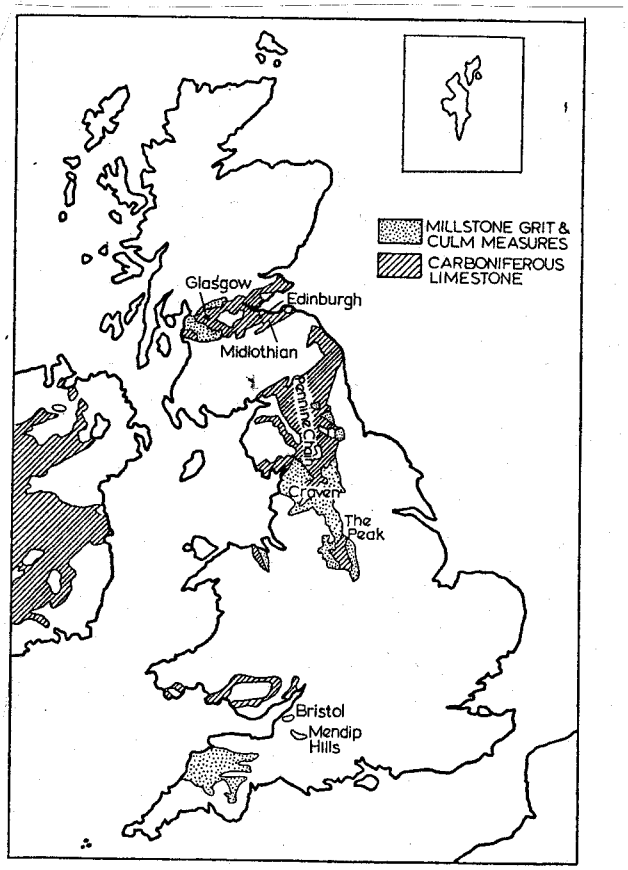


FIG. 27

Map showing the main outcrops of Carboniferous rocks older than the Coal Measures in Britain.

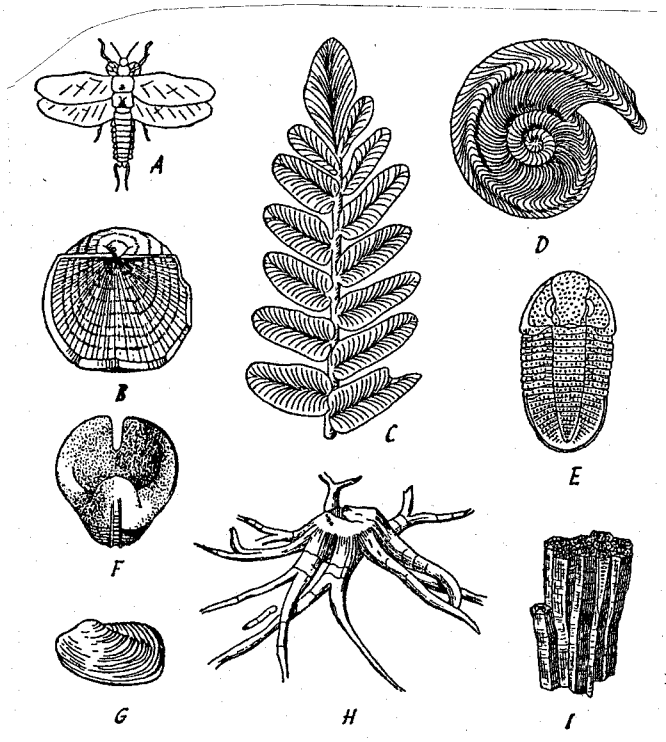


FIG. 28

Carboniferous fossils. *A*: primitive insect (after Handlirsch), × ½; *B*: brachiopod, × ½; *C*: compound leaf of a seed-fern, × 1; *D*: early ammonoid or goniatite (after Institute of Geological Sciences), × 1½; *E*: one of the last of the trilobites, × 1; *F*: marine snail or gastropod, coiled in one plane, × 1; *G*: non-marine bivalved mollusc or lamellibranch, × ½; *H*: stump and roots of a Coal Measure tree (after Williamson), × 1/25; *I*: part of a compound coral colony, × ½.

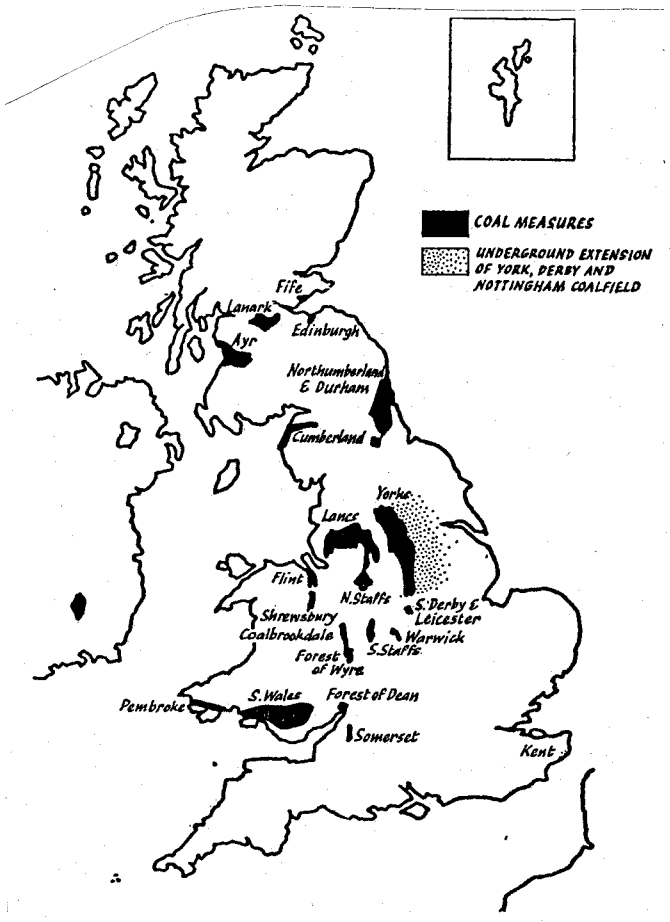
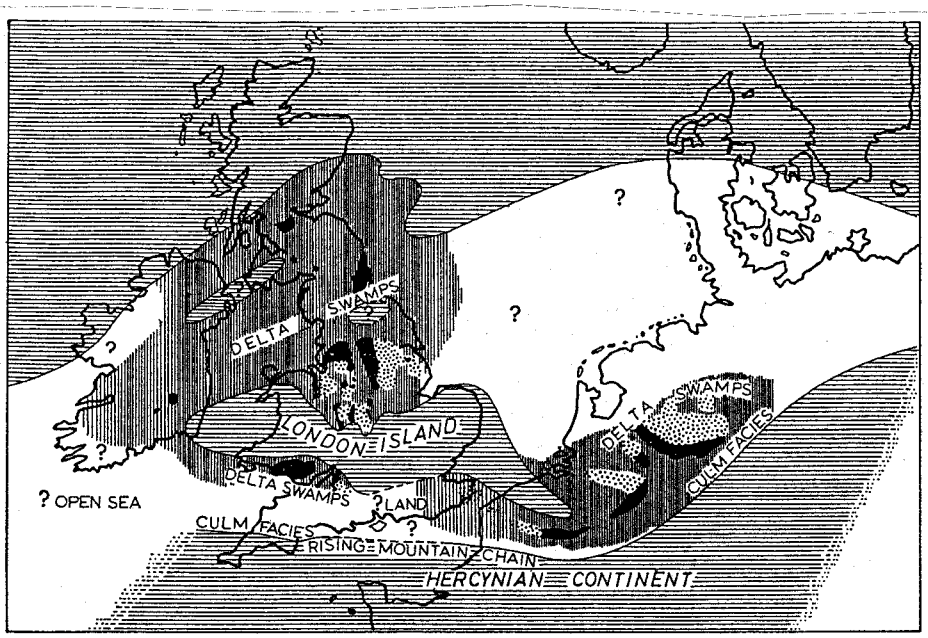


FIG. 29

Map showing the main outcrops of Coal Measures in Britain. It should be noted that the Kent coalfield is completely concealed beneath younger rocks.



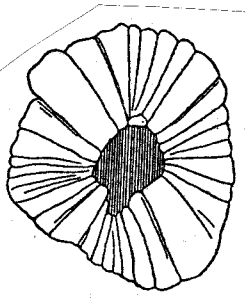


FIG. 30

Map showing the supposed geography of north-west Europe during Coal Measure times. Exposed coalfields are shown black, and concealed coalfields stippled. (Slightly simplified from *A Palaeogeographical Atlas of the British Isles* . . . by L. J. Wills, by kind permission of the author and Messrs. Blackie & Son, Ltd.).

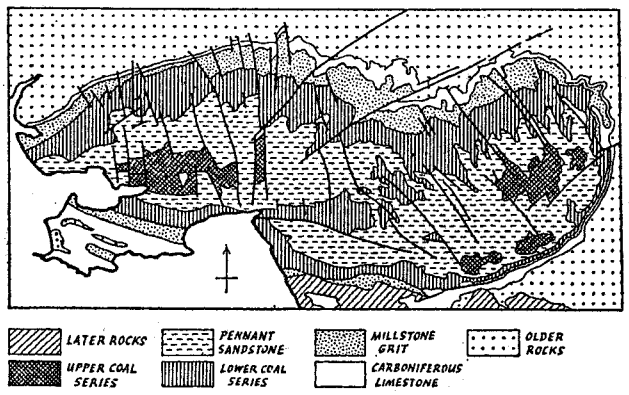


FIG. 31

Geological sketch-map of the South Wales coalfield (re-drawn, slightly simplified from British Regional Geology Handbook *South Wales* by permission of the Controller of H.M. Stationery Office).

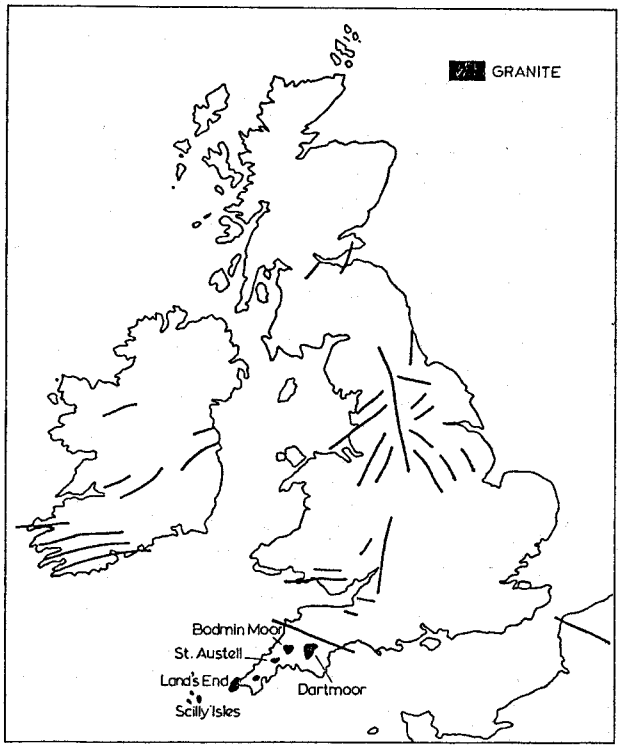


FIG. 32

Map showing the main trends of Hercynian folding in Britain, with some of the granite masses emplaced at this time.

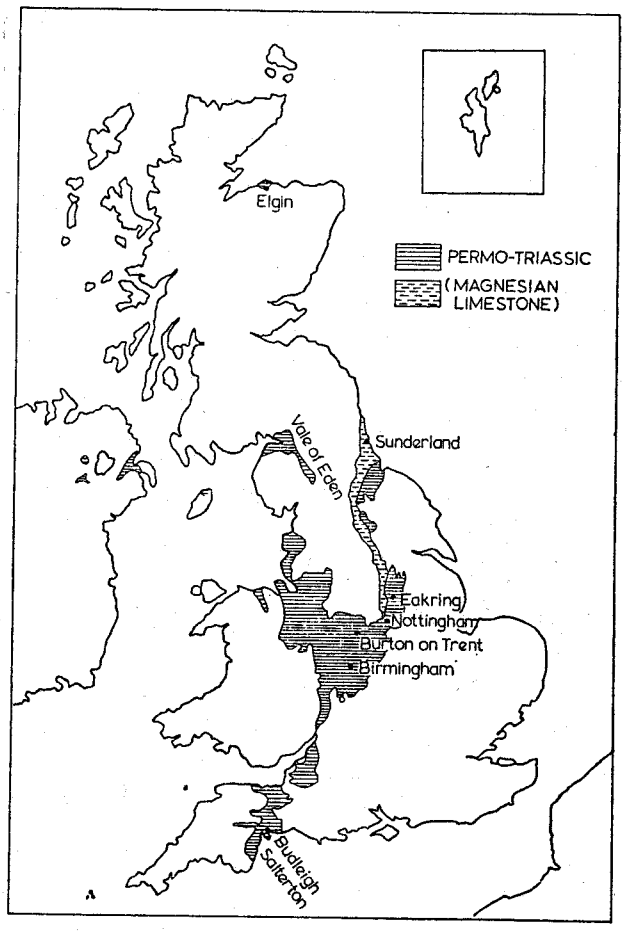


FIG. 33

Map showing the main outcrops of Permian and Triassic rocks in Britain.

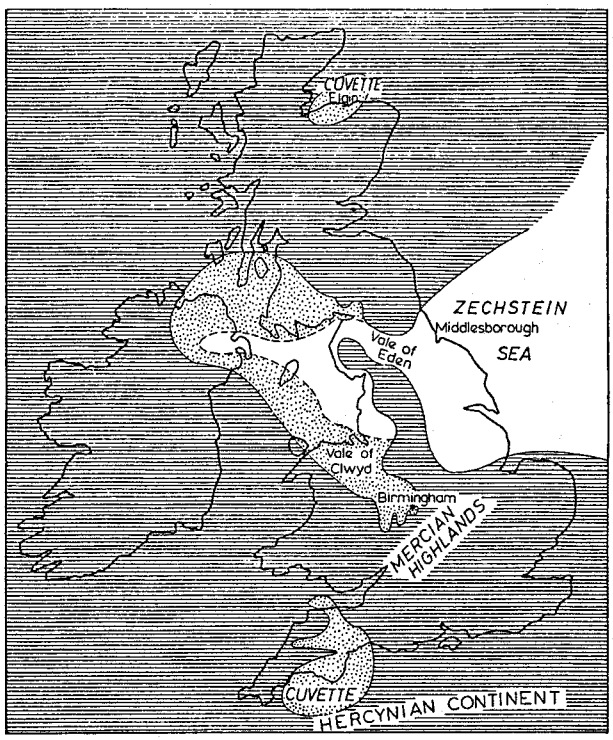


FIG. 34
Reconstruction of the supposed geography of late Permian times. (Simplified from *A Palaeogeographical Atlas of the British Isles* . . . by L. J. Wills, by kind permission of the author and Messrs. Blackie & Son, Ltd.). The stipple indicates areas of land deposition.

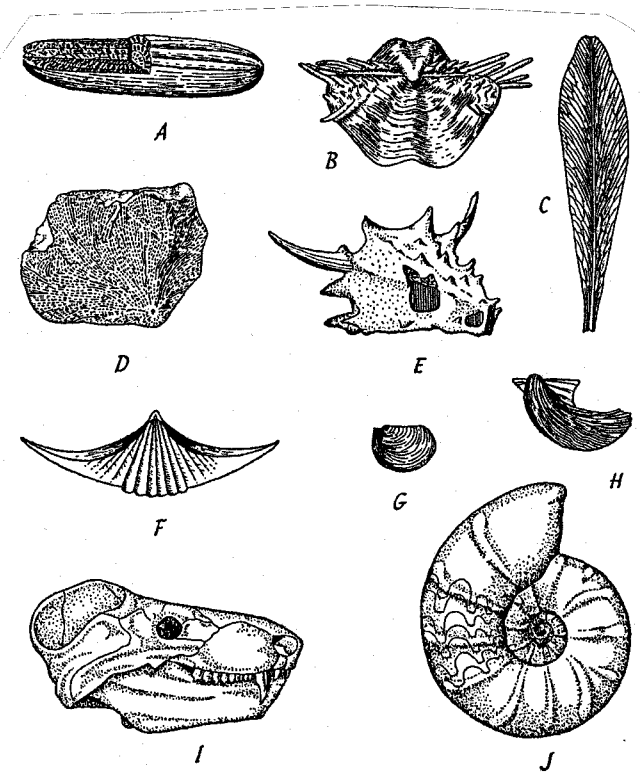


FIG. 35
Permian and Triassic fossils. *A–E*: Permian fossils. *A*: fusulinid, a giant foraminifer (after Zittel), × 3½; *B*: spiny brachiopod belonging to a group near extinction (after King), × ⅔; *C*: leaf of *Glossopteris* from the southern hemisphere, × ½; *D*: polyzoan, a plant-like colonial animal (after King), × ⅔; *E*: skull of an early reptile from Elgin, × ⅛. *F–J*: Triassic fossils. *F*: aberrant brachiopod from the Alps, × 2; *G*: bivalved crustacean from a desert pool, × 2; *H*: small bivalve mollusc from the Rhaetian beds of England, × ⅔; *I*: skull of a mammal-like reptile from South Africa (after Seeley and others), × 1/10 *J*: ammonite from the Muschelkalk showing characteristic partitions, × ½.

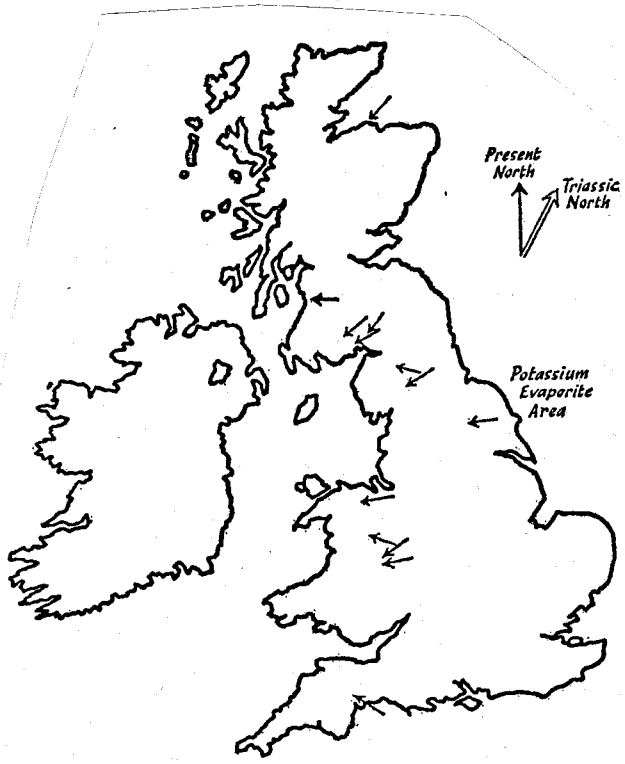


FIG. 36
Prevailing wind directions in the Permo-Triassic desert (redrawn from a map published by Professor F. W. Shotton by kind permission of the author).

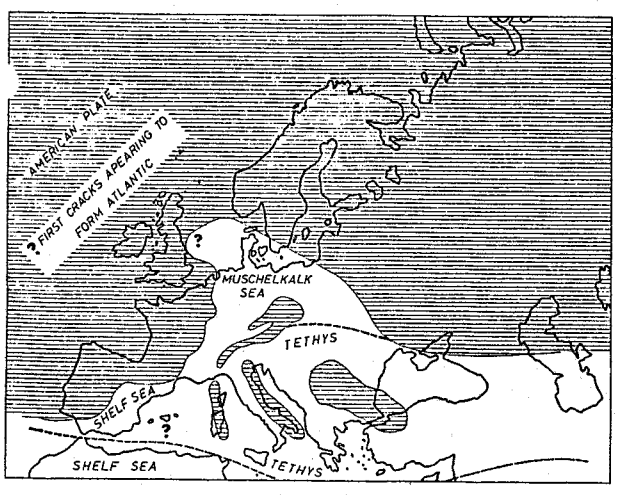


FIG. 37
Reconstruction of the supposed geography of mid-Triassic times. (Slightly simplified from *A Palaeogeographical Atlas of the British Isles* . . . by L. J. Wills, by kind permission of the author and Messrs. Blackie & Sons, Ltd.)

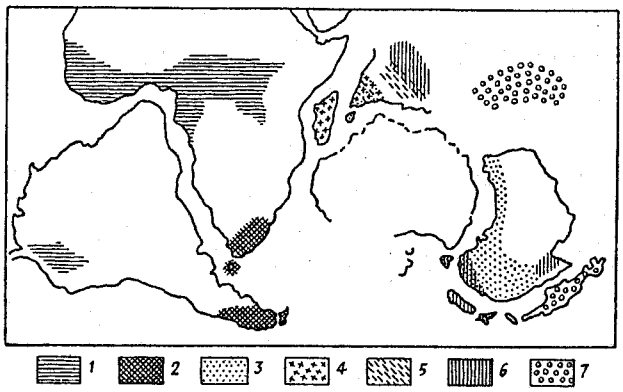


FIG. 40
Map showing the distribution of certain genera of living 'rain-worms' (family MEGASCOLECIDAE). 1: *Dichogaster*; 2: *Chilota*; 3: *Megascolex*; 4: *Howascolex*; 5: *Octochaetus*; 6: *Perionyx*; 7: *Pheretima* (re-drawn from *Our Wandering Continents* by A. L. du Toit, by kind permission of Messrs. Oliver & Boyd Ltd.).

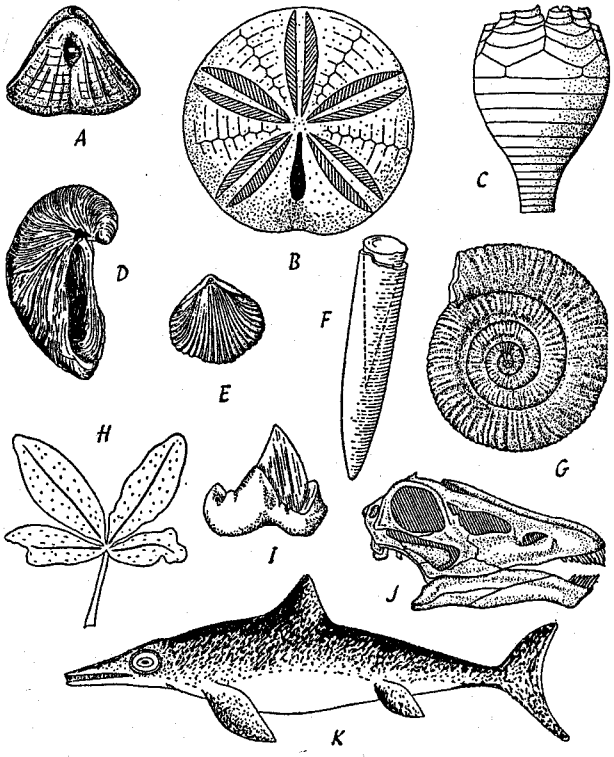


FIG. 41
Jurassic fossils. *A*: aberrant brachiopod from the Alps, × ⅔; *B*: large sea-urchin or echinoid, × ½; *C*: part of stem and cup of an unusual crinoid (after Institute of Geological Sciences), × ½; *D*: oyster with strongly incurved apex, × ½; *E*: brachiopod, × ½; *F*: belemnite counterweight or guard, with part of conical shell in which the animal lived (after Davies), × ½; *G*: ammonite (after Institute of Geological Sciences), × ⅛; *H*: leaf of seed-bearing plant (after Seward), × ½; *I*: early mammalian tooth from Swanage (after Simpson), × 14; *J*: skull of a large herbivorous dinosaur × $\frac{1}{14}$; *K*: reconstruction of a marine reptile, × $\frac{1}{24}$.

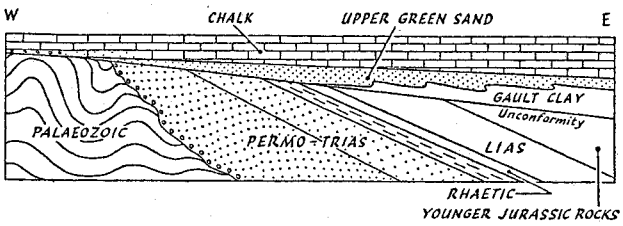


FIG. 49
Diagrammatic representation of the overstep of the Cretaceous rocks on to older formations in south-west England.

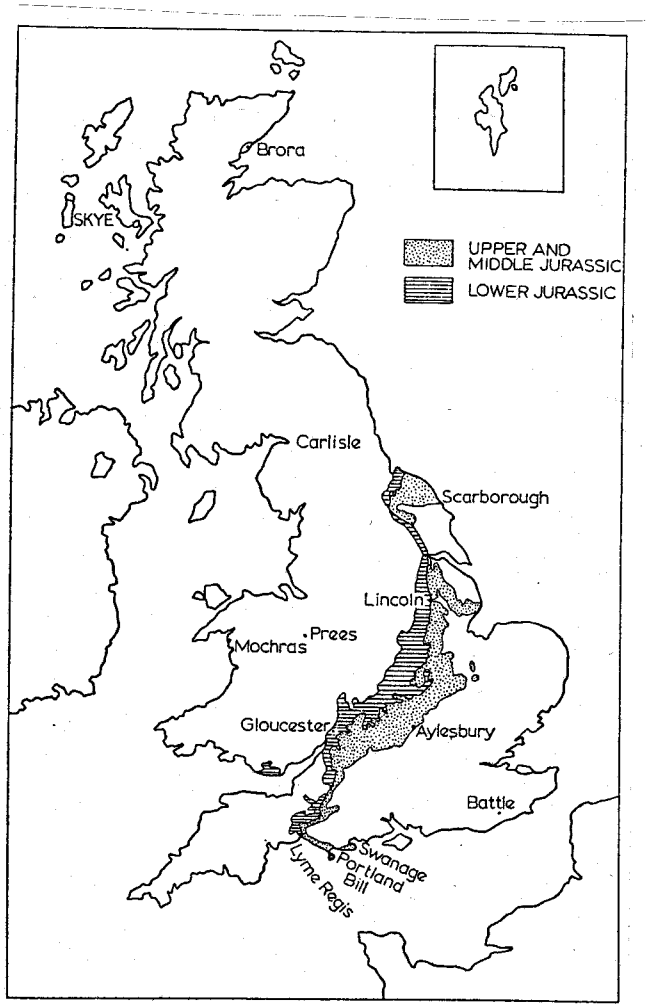


FIG. 42
Map showing the main outcrops of Jurassic rocks in Britain.

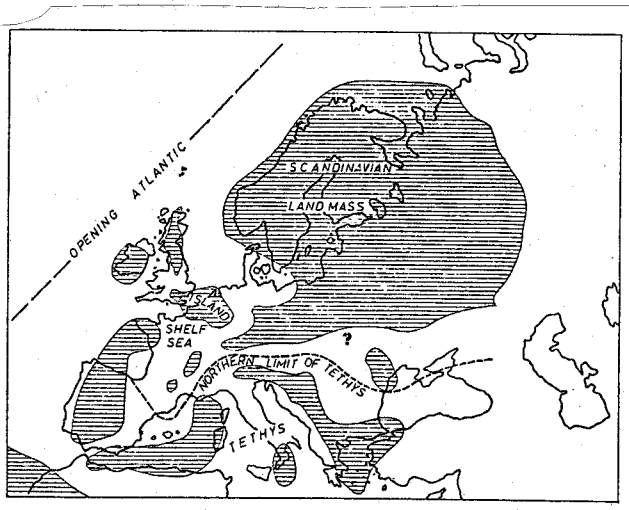


FIG. 43
Reconstruction of the supposed geography of Europe during early Jurassic times

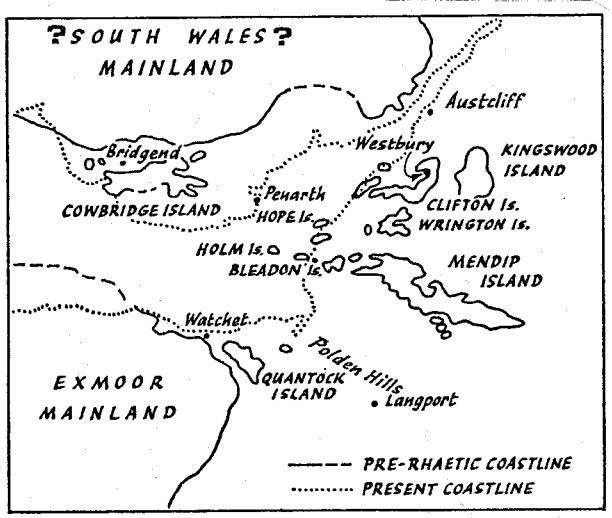


FIG. 44
Sketch-map of St. David's archipelago at the beginning of Rhaetian times (after Arkell—from earlier authors).

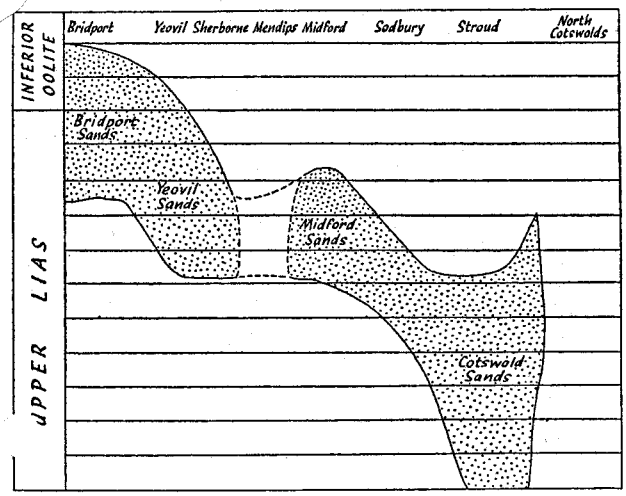


FIG. 45
Diachronism in Lower and Middle Jurassic sands. The diagram shows how the deposition of the sands cuts across the time planes (shown horizontally) from place to place, and becomes progressively later towards the south (after Arkell).

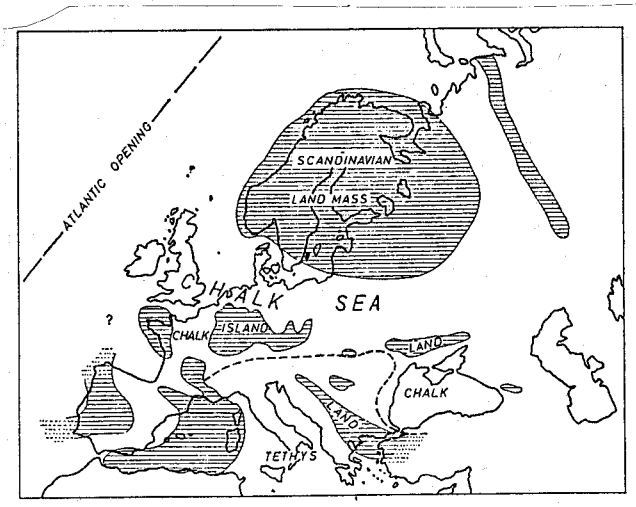


FIG. 47
Reconstruction of the supposed geography of Europe during late Cretaceous times, with the Chalk sea extending from Ireland in the west to Turkey and the Crimea in the east. (Simplified from *A Palaeogeographical Atlas of the British Isles* . . . by L. J. Wills, by kind permission of the author and Messrs. Blackie & Son, Ltd.)

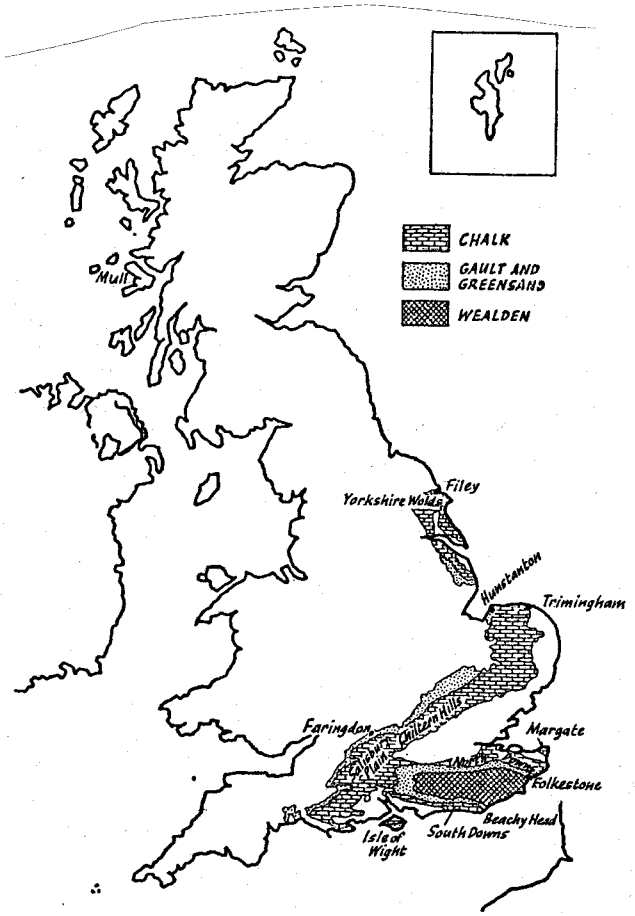


FIG. 46
Map showing the main outcrops of Cretaceous rocks in Britain. The lines in north-east Ireland indicate Cretaceous outcrops which cannot be differentiated on a map of this scale.

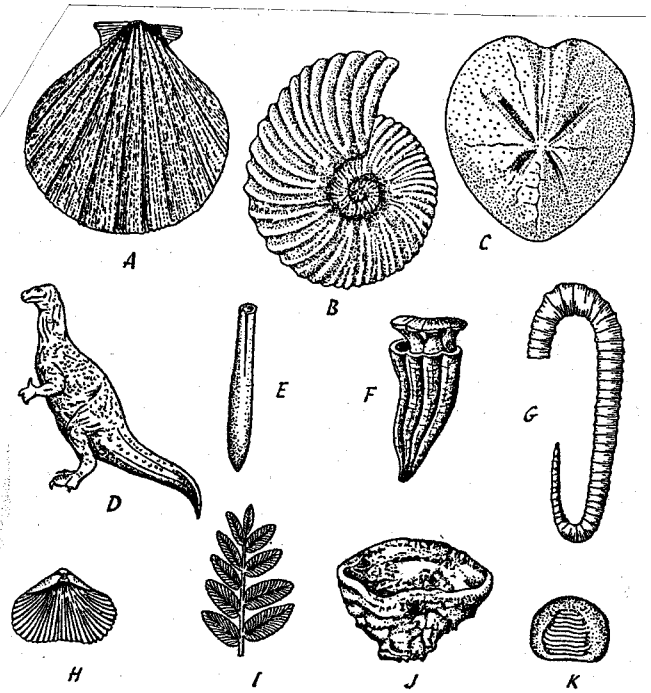


FIG. 48
Cretaceous fossils. *A*: bivalved mollusc—scallop, × ½; *B*: ammonite (after Institute of Geological Studies), × ¾; *C*: sea-urchin or echinoid, × ½; *D*: reconstruction of a herbivorous dinosaur, × $\frac{1}{100}$ (the animal was about 20¼ feet high); *E*: belemnite guard, × ½; *F*: aberrant mollusc from the south of Europe, × ½; *G*: uncoiled ammonite, × ½; *H*: brachiopod, × ¾; *I*: fern leaf, × ½; *J*: sponge from Faringdon (after Geological Survey), × ½; *K*: palate tooth of a shark, × ½.

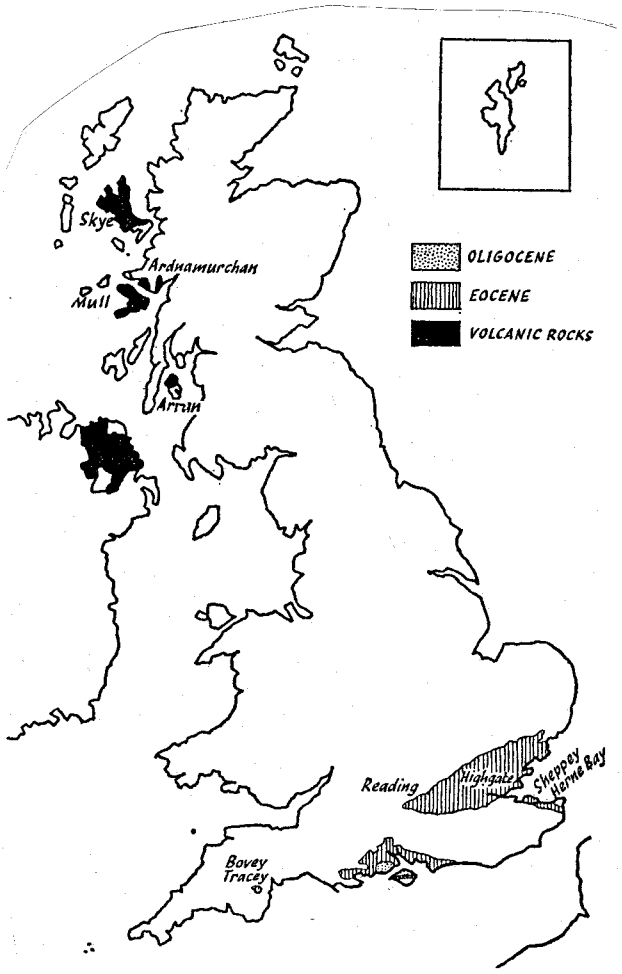


FIG. 50
Map showing the main outcrops of Palaeogene rocks in Britain

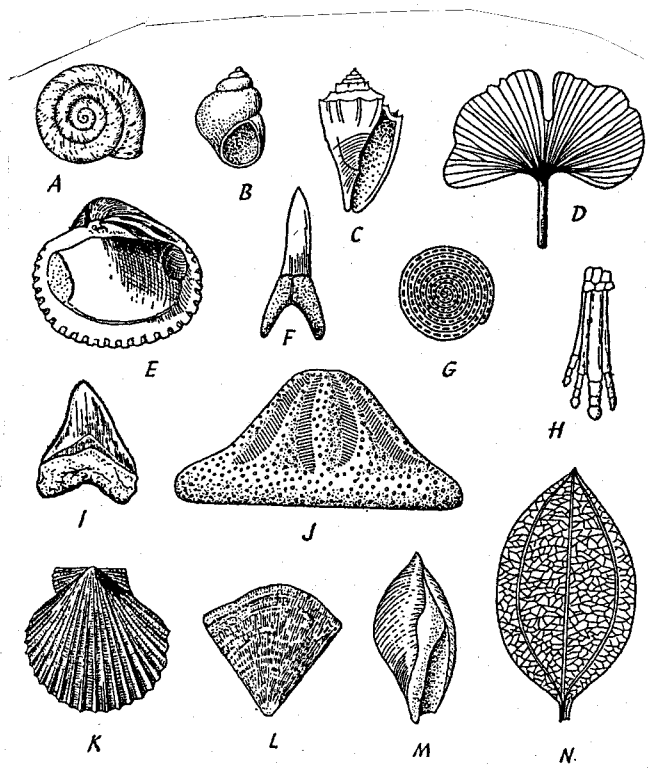


FIG. 55
Tertiary fossils. *A–H*: Palaeogene fossils. *A* and *B*: fresh-water snails (after Institute of Geological Sciences), both × ⅔; *C*: marine snail or gastropod, × ⅔; *D*: leaf of the maiden-hair tree—*Ginkgo*, × ½; *E*: bivalved marine mollusc or lamellibranch, × ⅔; *F*: shark's tooth, × 1½; *G*: *Nummulites*, a large coin-like foraminifer, × 1; *H*: fore-foot of an early four-toed horse, × ⅓. *I–N*: Neogene fossils. *I*: shark's tooth, × ⅔; *J*: large sea-urchin or echinoid, × ⅔; *K*: scallop (after Institute of Geological Sciences), × ⅔; *L*: fan-shaped coral (after Institute of Geological Sciences), × ⅔; *M*: thick-shelled, reef-dwelling gastropod, × ⅔; *N*: leaf from the Oeningen beds of Switzerland (after Heer), × ⅓.

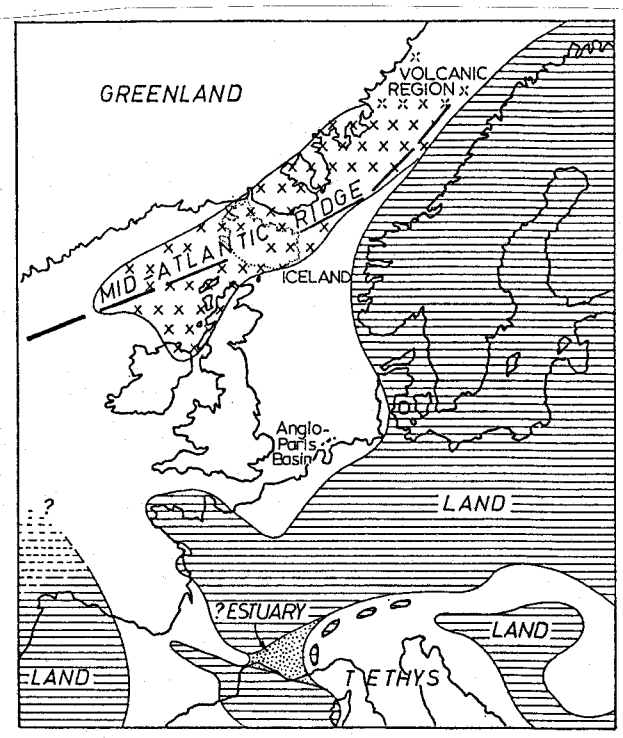


FIG. 51
Reconstruction of the supposed geography of north-west Europe during Palaeogene times (after Wills and others).

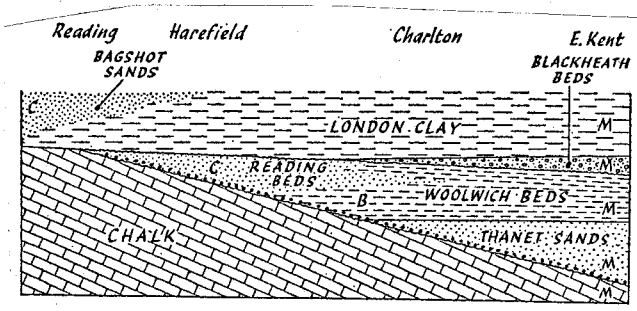


FIG. 52
Diagram to show change of facies of Eocene sediments in the London basin.
M = marine. *B* = brackish. *C* = continental.

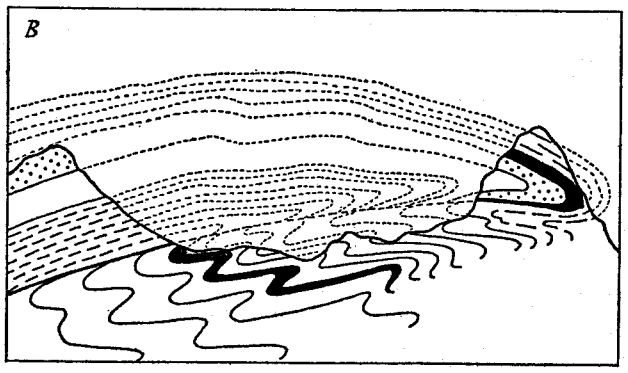


FIG. 56
Nappe structures in the Alps. *A*: a great pile of sediments, folded and pushed over from the left, has slid along a thrust plane over contorted rocks. *B*: the same 'nappe' is seen after a long period of erosion, when part of the front of the structure has been separated as a 'klippe' from its roots.

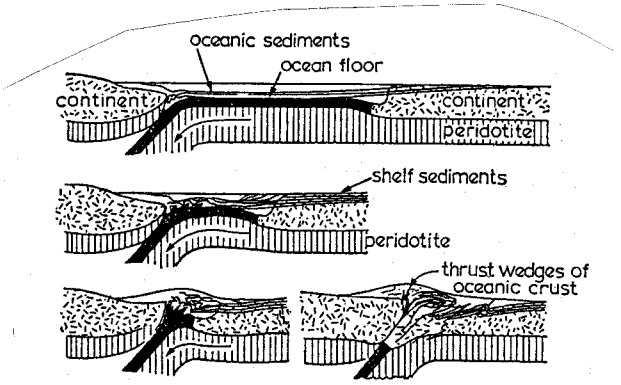


FIG. 57
Collision of two continental plates, involving both subduction and obduction of ocean floor material (after Dewey and Bird).

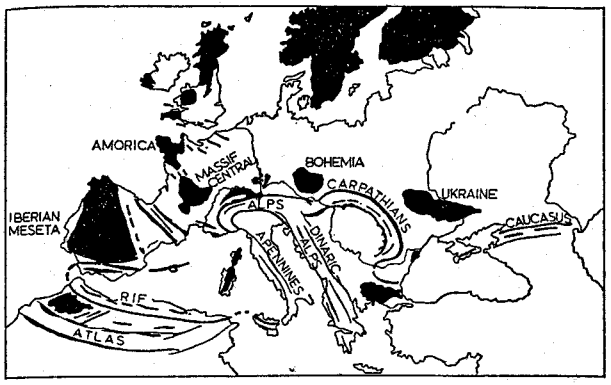


FIG. 58
Alpine folding in Europe: map showing the main belts and axes of folding during mid-Tertiary times. The old stable masses are shown in black, the fold-belts are shown as heavy black lines.

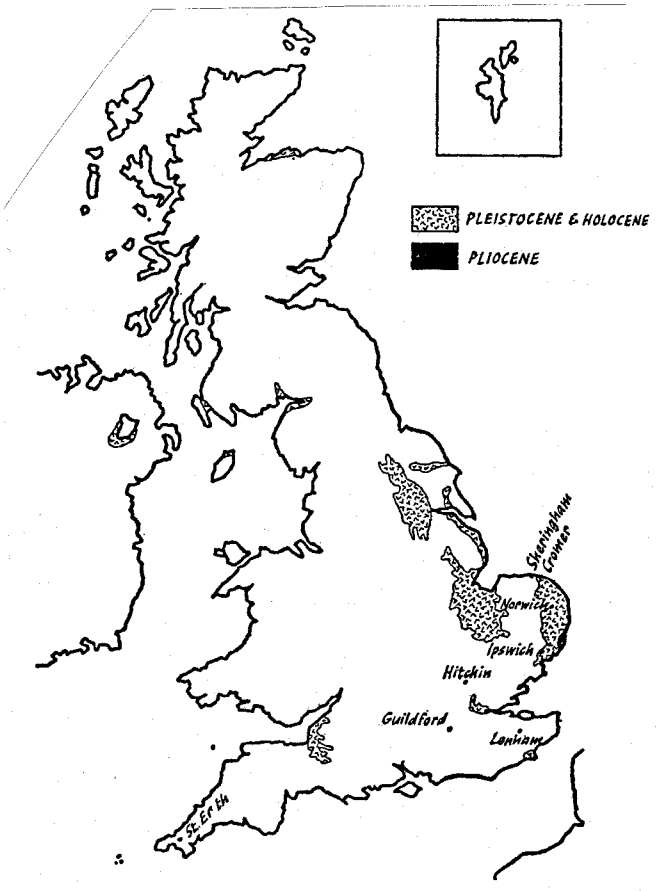


FIG. 59
Map showing the main outcrops of Neogene and Quaternary rocks in Britain, excluding glacial deposits.

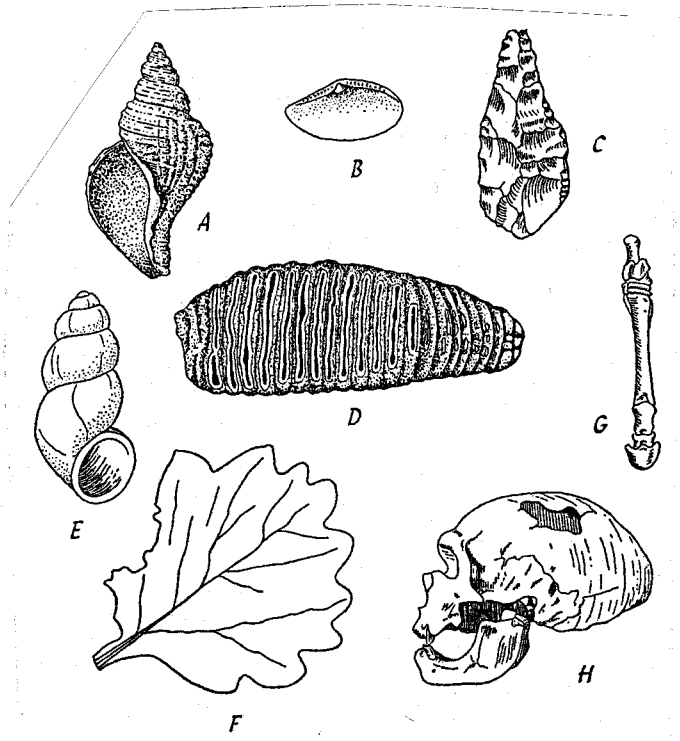


FIG. 60
Quaternary fossils. *A*: 'left-handed' marine gastropod (after Institute of Geological Sciences), × ⅔; *B*: cold water lamellibranch, × ½; *C*: early man-made hand-axe (after Woodward), × ½; *D*: grinding surface of a mammoth tooth, × ⅛; *E*: minute land snail (after Kerney), × 15; *F*: leaf of the dwarf birch (after Walton), × 8; *G*: fore-limb of the true horse, × 1/16; *H*: skull of Neanderthal man, × ⅓.

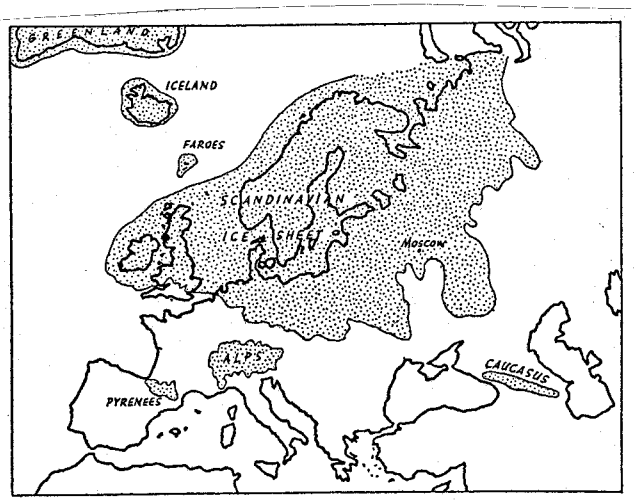


FIG. 61
Map showing the maximum extension of the ice-sheets over Europe during Pleistocene times. (Simplified from *A Palaeogeographical Atlas of the British Isles* . . . by L. J. Wills, by kind permission of the author and Messrs. Blackie & Son, Ltd.)