GEOLOGIC AND TOPOGRAPHIC ATLAS OF UNITED STATES.

The Geological Survey is making a geologic map of the United States, which is being issued in parts, each of which includes a topographic map and geologic maps of a small area of country, together with explanatory and descriptive texts.

The TOPOGRAPHIC MAP:

The features represented on the topographic map are of three distinct kinds: (1) inequalities of surface, called relief, or rises, plains, plateaus, valleys, hills, and mountains; (2) distribution of water, called drainage, as streams, lakes, and ocean; (3) the works of man, called roads, railroads, boundaries, villages, and cities.

Relief — All elevations are measured from mean sea level. The heights of many points are accurately determined, and those which are most important are given on the map in figures. It is desirable, however, to give the elevation of all parts of the area mapped, to delineate the outline or form of all slopes, and to indicate their grade or steepness. This is done by lines which cross the drawn through points of equal height, and the uniform altitudinal space between each two contours is called the interval. Contours and elevations are printed in brown.

The manner in which contours express elevation, form, and grade is as follows: sketch and corresponding contour map (fig. 1).

1. A contour indicates a certain height above sea level. In this illustration the contour interval is 50 feet; therefore the contours are drawn at 50, 100, 150, 200, and 250 feet, and so on, above mean sea level. Along the contour at 250 feet all points on the surface have the same height above the sea. The contours at 250 feet fall just below the edge of the term; while 200 feet lies on the contour; therefore all points on the surface are shown to be more than 150 but less than 200 feet above the sea.

2. Contours define the forms of slopes. Since contours are continuous horizontal lines, they wind smoothly over smooth surfaces, recede into all crevices and angles to form the landscape can be traced in the map and sketch.

Drainage — Watercourses are indicated by blue lines. If a stream flows the entire line is blue; or if a slope; but to rise a given height on a gentle slope one must go farther than on a steep slope, and therefore contours are apt to split apart on gentle slopes and meet together on steep ones.

For a flat or gently undulating country a small contour interval is used; for a steep or mountainous country a large interval is necessary. The smallest interval used on the atlas sheets of the Geological Survey is 50 feet. This is invariably used for regions like the Mississippi delta and the Dismal Swamp. In mapping great mountain masses, like those in Colorado, the interval may be 250 feet. For intermediate relief contour intervals of 10, 20, 30, and 40 feet are used.

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Uses of the topographic map.

For purposes of geologic mapping rocks of all kinds are classified into forms and species. A sedimentary formation contains between its upper and lower limits either rocks of uniform character or rocks which have been altered in various ways. A rock mass. Such changes transform sandstone into quartzite, limestone into marble, and modify other rocks. As a rule, the oldest rocks are most altered.

Fossils. — The works of man, such as roads, railroads, boundaries, villages, and cities, provide educational material for schools and homes; and in some cases the distinction and relief belong to the topographic form within a single rock mass. Such changes transform sandstone into quartzite, limestone into marble, and modify other rocks.

The contour represents a river valley between two hills. In the foreground is a terrace, which is partly closed by a hooked sand bar. On each side of the valley is a hill, and on the terrace on the right a hill rises gradually, while on the left that on the ground ascends steeply, forming a precipice. The uniform surface to which the terrace belongs is the slope, and the contour interval.

The area of the United States (excluding Alaska and island possessions) is about 3,020,000 square miles. A map representing this area, drawn on a scale equivalent to the surface of the earth, within a square inch. When the area of the map is divided by the contour interval.

The sketch represents a river valley between two hills. In the foreground is a terrace, which is partly closed by a hooked sand bar. On each side of the valley is a hill, and on the terrace on the right a hill rises gradually, while on the left that on the ground ascends steeply, forming a precipice. The uniform surface to which the terrace belongs is the slope, and the contour interval.

The most characteristic of the wind-borne or eolian deposits is loess, a fine-grained earth; the most common deposits are gravel, sand, and clay, which are later consolidated into conglomerate, sandstone, and shale. In these areas are called strata.

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As sedimentary deposits or strata accumulate the younger rest on those that are older, and the relative age of the deposits can be determined by observing their positions. This relationship holds except in regions of intense disturbance, in such regions sometimes the beds have been reversed, and it is often difficult to determine their relative ages from their positions. Then faults, or the remains and imprints of plants and animals, which indicate of two or more formations in the oldest. Stratiﬁed rocks often contain the remains or imprint of plants and animals which, at the time the strata were deposited, lived in the sea or were buried in surficial deposits on the land. Such rocks are called fossiliferous. By studying fossils, it has been found that the life of each period of the earth's history was a great contrast different from that of other periods. Only the simpler kinds of marine life existed when the oldest fossiliferous rocks were deposited. From time to time more complex kinds developed, and as the simpler ones lived on in modiﬁed forms life becomes more varied. But during each period there lived peculiar forms, which did not exist in earlier times and have not existed since; these are characteristic of the era. The names of the systems and recognized zones, in proper order from the top to the bottom, with the color and symbol assigned to each system, are given in the preceding table.

**Surface Formations**

Hills and valleys and all other surface forms have been produced by geological processes. For example, most valleys are the result of erosion by the streams that ﬂow through them (see fig. 1), and the alluvial plains bordering many streams were built up by the streams; seas exit made by the eroding forces of the waves and the sedimentary deposits. Topographic forms thus constitute parts of the record of the history of the earth. Some forms are produced in the making of deposits and are inseparably connected with them. The character of these deposits is shown in the preceding illustration (see fig. 4), and at this time the geologist follows the streams of uniform pale that form the modern valley, and the outlines of the associated material. The valley is an illustration; it may be carved from any rock. To this class belong abandoned river channels, glacial furrows, and peneplains. In the making of a stream terrace an alluvial plain is ﬁrst built up, and then it becomes partly eroded away by the current of a marine or lacustrine plain, usually in the double process, hills being removed (unstabilized) and valleys being ﬁlled up (aggraded).

Some parts of the land surface are subject to the action of air, water, and ice, which slowly wear them down, and streams carry the waste material to the sea. As the process depends on the ﬂow of water to the sea, it can not be carried below sea level, and the sea is therefore the base-level of erosion. When a large tract is on a higher level, it is occupied by a stream, and the symbols of the topography of the area are given in the preceding table. The legend is a partial statement of the geologic history. In it the formations are arranged in columnar form, grouped primarily according to origin—sedimentary, igneous, and metamorphic—within each group they are placed in the order of age, so far as known, the youngest at the top. Geologic map geology—This map represents the relation of the various formations. The plate in fig. 3 presents toward the lower land an unconsolidated, or front, which is made up of coarse deposits, sandstone, and conglomerate. The horizontal strata of the plateau rest upon the Appalachian or unconformable. The horizontal strata of the plateau rest upon the Appalachian or unconformable.

Patterns composed of parallel straight lines are used to represent strata in the sea or in the lake. Patterns of dots and circles represent alluvial, glacial, and sedimentary formations. Patterns of dots that are round represent igneous formations. Metamorphic rocks of unknown origin are represented by short dashes irregularly placed. If the strata are much contoured and their arrangement is not known, they are arranged in parallel lines to the strata.
# Published Geologic Folios

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