AN ELEMENTARY TREATISE OF SPHERICAL GEOMETRY AND TRIGONOMETRY

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AN ELEMENTARY TREATISE OF SPHERICAL GEOMETRY AND TRIGONOMETRY.

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SPHERICAL GEOMETRY.

SPHERICAL TRIGONOMETRY.

SPHERICAL GEOMETRY.

DEFINITIONS.

1. A *sphere* is a solid such that all points in its surface are equidistant from a certain point within called the *center*.

2. A *radius* of a sphere is any straight line drawn from the center to the surface.

All radii of a sphere are equal.

3. A sphere may be described by the revolution of a semicircle about its diameter, the middle of the diameter being the center, and half the diameter a radius of the sphere.

4. A *diameter* of a sphere is any straight line passing through the center and terminating each way in the surface.

All diameters of a sphere are equal, each of them consisting of two radii.

5. The *axis* of a sphere is a diameter about which the sphere is supposed to have been described by the revolution of a semicircle.

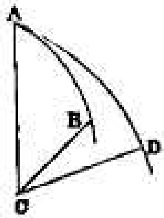
6. Every intersection of a plane with a sphere is a *circle*, as will be seen from the demonstration of Prop. VI.

7. The intersection of a sphere with a plane passing through the center is called a *great* circle, and its intersection with any other plane, a *small* circle.

8. The *axis* of a *circle* of a sphere, is that diameter of the sphere which is perpendicular to the circle.

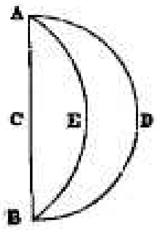
The extremities of the axis are called the *poles* of the circle.

9. The angle made by the arcs of two great circles is called a *spherical angle*, and is to be regarded as the same with the angle between the *planes* of the circles.



Thus, BAD is a spherical angle, having for its substitute the angle between the planes ACB and ACD, supposing C to be the center of the sphere.

10. A *spherical lune* is a part of the surface of a sphere included between two great semicircles having a common diameter, as ADBE.



A *spherical ungula* or *wedge* is a part of a sphere, bounded by a lune and the two great semicircles which include the lune, as CADBE.

11. A *spherical triangle* is a part of the surface of a sphere, included between the arcs of three great circles.

The arcs are called *sides* of the triangle.

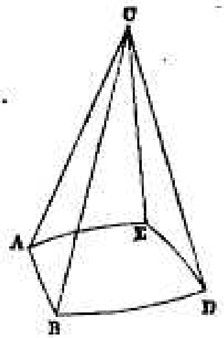
12. Spherical triangles are distinguished as *right-angled*, *isosceles*, *equilateral*, &c., in the same way as plane triangles.

A *quadrantal* triangle is that of which one side is a quadrant.

13. A *spherical polygon* is a portion of the surface of a sphere, bounded by several arcs of great circles; which arcs are called *sides* of the polygon.

14. Each side of a triangle or a polygon must be understood to be *less* than a *semicircumference* of a great circle, unless the contrary is stated.

15. A *spherical pyramid* is a part of the sphere, contained by the planes of a solid angle whose vertex is the center, and the spherical polygon included by these planes; as ABCDE.



The polygon is called the *base* of the pyramid.

When the base is a spherical triangle, the pyramid is called *triangular*.

16. A line or plane is said to *touch* or *be tangent to* a sphere, when it meets the surface of the sphere in one point only.

And two spheres are said to *touch* each other, when they meet and do not intersect.

STRAIGHT LINE AND SPHERE.

Prop. I.

If a perpendicular drawn from the center of a sphere to any straight line be equal to the radius of the sphere, this line touches the sphere at the foot of the perpendicular.

For since the perpendicular is equal to the radius, the foot of the perpendicular is in the surface of the sphere; the line therefore *meets the surface* at the foot of the perpendicular: and every other point in the line is *without the surface*, being further from the center of