Further, it may be confidently anticipated that the men of science and scientific institutions of the Czecho-Slovak republic will accomplish much in the way of scientific advancement in the future, and consequently will receive more adequate notice in British journals than has hitherto been the case (compare Prof. Brauner's own resumé of "Science in Bohemia" in NATURE, May 13).

Finally, many Russian authors now publish in Czech journals and consequently use the Czech transcriptions for their own names.

J. G. F. DRUCE.

May 24, 1922.

Immediate Solution of Dynamical Problems.

A DISCUSSION is submitted here in the manner called elementary, where the theorems of the gravitation of a sphere are proved for any portion of a spherical surface, such as a bowl, before proceeding to the result for a complete sphere (see letter by Prof. Andrew Gray in NATURE, May 20, p. 645).

Consider the potential (Fig. 1) at P, dU, and attrac-

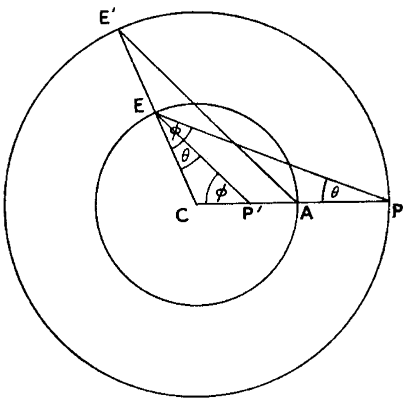

FIG. 1.

tion to the centre, dF, of a small element dS at E, of the surface of a sphere, centre C and radius $CA=c$, taken of superficial density σ, g/cm², with G the gravitation constant. Then

$\frac{dU}{G\sigma}=\frac{dS}{EP}$, with $EP=CE\cos\phi+CP\cos\theta$, so that, with $CP=r$, and P′ the inverse point to P in the sphere, $CP'=r'=\frac{c^2}{r}$, $\frac{dS}{EP}=\frac{dS}{EP^2}(CE\cos\phi+CP\cos\theta)$

$$=CE\frac{dS\cos\phi}{EP^2}+CP'\frac{dS\cos\theta}{EP'^2}\quad\left(\text{because}\quad\frac{CP}{CP'}=\frac{EP^2}{EP'^2}\right)$$

$$=CE\,d\omega+CP'd\omega'=c\,d\omega+r'd\omega'=c\,d\omega+\frac{c^2}{r}d\omega',$$

reckoning the solid angles $d\omega$, $d\omega'$ subtended by dS at P, P′ as positive when the aspect of the surface is the concave side.

Then by summation over any finite portion of the spherical surface,

$\frac{U}{G\sigma}=c\omega+r'\omega'$, not restricted to the spherical bowl result in Maxwell's "Electricity and Magnetism."

And for F, the radial component acting along PC of the attraction at P,

$$\frac{dF}{G\sigma}=\frac{dS\cos\theta}{EP^2}=\frac{CP'}{CP}\frac{dS\cos\theta}{EP'^2}=\frac{r'}{r}d\omega'=\frac{c^2}{r^2}d\omega',\ \frac{F}{G\sigma}=\frac{c^2}{r^2}\omega'.$$

These two or three lines of geometry can thus replace some pages of analysis in Maxwell's "Electricity and Magnetism."

For a complete sphere, and P inside, $\omega=4\pi$, $\omega'=0$, $\frac{U}{G\sigma}=4\pi c$, $F=0$, and P outside, $\omega=0$, $\omega'=4\pi$, $\frac{U}{G\sigma}=4\pi r'=\frac{4\pi c^2}{r}$, $\frac{F}{G\sigma}=\frac{4\pi c^2}{r^2}$; the well-known theorems for a complete spherical shell, and thence for a solid sphere, given first by Newton in the "Principia" (I, 41), and of pioneering interest in justifying his theory of gravitation for a body, like an apple, brought from the moon down to the surface of the earth.

A recent article by Florian Cajori, on Newton's discovery of Gravitation, in the *University of California Chronicle*, April 1922, is worth the attention of Prof. Andrew Gray, in its bearing on his own historical reflexions on the importance of the attraction of a sphere in Newton's theory of universal gravity.

The further theorem, that the mean potential over the sphere of any body M outside the sphere is equal to the potential of M at the centre, is obvious by transferring an element of M at P to the other end of the vector PE. Or if M is inside the sphere, the mean potential over the surface is M/c.

In hydrodynamical analogy, the flux across any surface fixed in an incompressible liquid is the equivalent of liquid supplied to the interior from outside, and so interpreting and justifying the theorem of Gauss, between the surface integral of normal force and the attracting body M, inside or outside.

In this way the precept of Poinsot can be followed, to examine the nature of things in themselves by direct vision, and not through a mist of equations and formulas.

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Arabic Chemistry.

IN a manuscript in my possession of the "Rutbatu 'l-Ḥakīm" of Maslima ibn Muḥammad Abu 'l-Qāṣim al-Majrīṭī († 1004 A.D.) the author claims to have written the section on chemistry in the celebrated "Letters" of the Ikhwānu's-Ṣafā (Brethren of Purity), the well-known Encyclopædists of Islām in the tenth century A.D. I believe this fact to have been hitherto unknown, as it is not mentioned by Dieterici or Brockelmann nor by Shahrazūrī, all of whom give as the names of the authors of the "Letters" only the following five: Abū Sulaimān Muḥammad ibn Naṣr al-Bustī, Abu 'l-Ḥasan 'Alī ibn Hārūn az-Zinjānī, Abū Aḥmad an-Nahrajūrī, al-Aufī and Zaid ibn Rifa'a.

Maslima al-Majrīṭī was an accomplished chemist, and his work the "Rutbatu 'l-Ḥakīm" was mentioned by Ibn Khaldūn in the "Prolegomena" to his history. Although much of the "Rutba" is, as Ibn Khaldun observes, very enigmatical, yet there are certain passages in it of considerable historical interest to chemists. Two of these I give below.

1. "I took natural quivering mercury, free from impurity, and placed it in a glass vessel shaped like an egg. This I put inside another vessel like a cooking-pot and set the whole apparatus over an extremely gentle fire. The outer pot was then at such a temperature that I could bear my hand upon it. I heated the apparatus day and night for 40 days, after which I opened it. I found that the mercury (the original weight of which was ¼ lb.) had been completely converted into a red powder, soft to the touch, the weight remaining as it was originally."

2. [On the refinement of gold and silver.] "Silver alloyed with lead may be separated from the latter by placing it in a cupel made from bones (called the 'dog's head' or commonly the *kūraja*; it is a crucible made from burnt bones) and fusing it by means of a strong fire. The lead is removed and absorbed by the cupel and the fire makes manifest