change a definite electromotive force has to be inserted between the calomel electrode and the earth. In this way it can easily be shown that a monomolecular layer of oleic acid makes the water surface more positive by 0.22 volt, whereas the same effect for lauric acid amounts to 0.27 volt and for olive oil to 0.33 volt. On replacing the water in the vessel by a solution of a capillary active substance, data are obtained which can be compared with those given by the Kenrick method. In this way I have found a positive effect equal to 0.27 volt for 50 per cent. acetic acid and a negative one equal to 0.38 volt for a molar solution of chloral hydrate, whereas the Kenrick method gave for the same solutions in a fair agreement +0.285 and -0.365 volt respectively (*Zeitschr. f. physik. Chem.*, in press).

The experiments are to be continued, and a detailed account will be published in the *Zeitschr. f. physik. Chem.* A. FRUMKIN.

Karpov Chemical Institute,
Moscow, July 3.

The Oogenesis of Lithobius.

MISS S. D. KING in her note on the oogenesis of *Lithobius* published in *NATURE* of July 12, p. 52, says:

"Yolk formation is from nucleolar extrusion, of which two phases can be distinguished; first, an early extrusion of particles budded off from the large central nucleolus, which retains its individuality, and, secondly, an extrusion of particles derived from the fragmentation of this nucleolus."

In a paper on the oogenesis of *Lithobius* now in the press (Proceedings Cambridge Philosophical Society), I have shown that there is no fragmentation of the nucleolus. It can be seen in the most highly developed oocytes obtainable from the ovary as a completely acidophil structure with prominent vacuoles. The nucleus at this stage lies just below the chorion. As to budding of the nucleolus, there are two kinds of nucleolar extrusions: small circular bodies, which generally form the secondary nucleoli, and large irregular bodies, which are first plastered round the nuclear membrane, where they may bud off smaller pieces, and are later detached and lie in the cytoplasm.

Nor is there any direct evidence for the statement that "the later extrusions enlarge after proliferation to form the definitive yolk spheres." All that can be said with certainty is that the nucleolar extrusions precede yolk formation, although a few may exist side by side with yolk spheres.

With regard to the Golgi apparatus, I have definitely established that during fragmentation it undergoes fatty degeneration, and gives rise to fatty yolk, which forms the uppermost area in the centrifuged egg, whereas the true vitelline yolk is thrown down. Both direct and indirect evidence has been adduced in favour of this statement. The fatty yolk is intensely blackened by chrome-osmium alone; with Da Fano it turns brownish. The mitochondria, the nucleus, and a few unchanged Golgi elements form the central area of the centrifuged egg.

In view of the remarkable transformation of the Golgi elements in the oocytes of *Lithobius*, which is paralleled only in *Saccocirrus* (Gatenby), and also in view of the egg-like giant spermatocytes of *Lithobius*, it was considered desirable to extend the investigations to the Golgi apparatus in the male germ cells. No fatty degeneration of the apparatus takes place in these cells. In the spermatogonia the apparatus consists of at least one circular element, in the centre of which is a definite archoplasm. During the remarkable growth phase the circular element proliferates profusely, so that the spermatocytes are full of such elements. Each circular element may also divide in such a manner as to form two very regular crescents, each with an archoplasm. During meiosis the distribution of the Golgi elements is quite haphazard. During spermateleosis all the mitochondria and the majority of the Golgi elements form the tail sheath, but a few Golgi elements are plastered round the anterior face of the nucleus, and probably give rise to the acrosome.

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Cambridge, July 14.

Approximate Rectification of the Parabola.

RECENTLY I had to ascertain with some precision the length of the curved path of a shot in air at elevations up to 40° as compared with the horizontal range.

The material available was a quantity of trajectories worked out in full detail by "small arcs." The error in summing these small arcs and considering the result to be the length of the curved path was within ± 0.10 per cent. The greatest heights were also contained in the calculations.

Assuming the parabola of equal angle of projection and of equal height as standard and comparing the actual length, the length of a similar circular arc and the "fudge" formula $L = R \sec E$ to this standard, the result is surprising, and is as follows in parts per thousand:

Elevation in Degrees.	10	20	30	35	40
Parabolic error	0	0	0	0	0
Actual length	+1.0	+4.5	+7.0	+8.5	+8.5
R sec E	0	0	0	+0.8	+4.5
Circular arc	0	+2.0	+10.0	+18.0	+31.0

On comparing notes with professional ballisticians, I cannot find that the "fudge" R sec E was known to Tartaglia, Galileo, Newton, or Benjamin Robins, nor has it yet been found in any modern book on ballistics or geometry. I hit on it myself by pure chance. Can any reader of *NATURE* supply a reference?

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Electric Charges by Friction.

THE following quotations from a book printed nearly one hundred years ago (Murray's "Elements of Chemistry," Sixth edition, Edinburgh, 1828) bear on the observations of an anomaly in frictional electricity referred to recently in *NATURE* (June 21, p. 914). "A white silk ribbon rubbed against a black one becomes positively electrified; but if the black ribbon be worn so that the colour is faded, and if the white ribbon be heated, the latter will be found to be negative, and the black positive."

As a result of consideration of a large number of such experiments, M. Coulomb inferred "that where the particles suffered a transient compression, they would be more disposed to become positive; where they suffered dilatation, the tendency would be to the reverse state."

This inference seems to receive support in the recent experiments with rough and smooth ebonite rods.

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July 4.