looked upon as a standard in this class of literature.

KONOPS

HOW A FALLING CAT TURNS OVER IN THE AIR

TO THE EDITOR OF SCIENCE: In a lecture on the gyrostat before the Washington Society of Engineers, I gave a valid explanation of how a cat is able to light on his feet when he is dropped back downwards. After the lecture Professor J. F. Hayford was kind enough to call my attention to what is no doubt the actual character of this cat performance, and I give a statement of it herewith for the readers of SCIENCE. However, I prefer the idea I had formerly of the cat performance, because I am able to do it myself, not indeed while falling through the air but while standing on a pivoted stool. It is my impression that the idea I had formerly is the generally accepted idea of the cat performance, but it is difficult to explain, although easy to perform.

The curved figure in the accompanying sketch is a conventionalized cat which is let fall back downwards, and the question is how can a cat (not so highly conventionalized) turn over and light on its feet.

FIG. 1

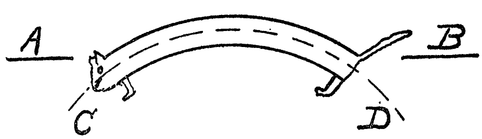


FIG. 2

There are two simple types of motion of the cat's body which give spin momentum around the axis AB, namely, (a) a rotation around AB as an axis of the cat's body as a rigid structure, and (b) a sort of squirming motion in which each part of the cat's body rotates about the curved line CD.

The amount of spin momentum due to a spin velocity a of the first kind is Ka, and the amount of spin momentum due to a squirming velocity b of the second kind is kb; and the factor k[1] is always less than the factor K when the cat's body is curved.

Now suppose the falling cat to exert the muscular action necessary to produce and maintain a squirming velocity b; then the cat's body will simultaneously be set spinning in the first mode at spin velocity a such that

$$Ka + kb = 0$$

or

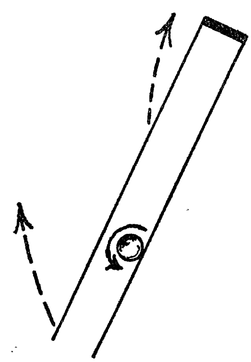
$$b = -(K/k)a,$$

because no spin momentum can be produced by forces inside the cat. Therefore a and b are opposite in sign and b is greater than a. Suppose, for example that b is twice as great as a; then while the cat squirms one complete revolution ($bt = 360°$) his bent form will rotate backwards through half a revolution ($at = 180°$), and the cat will be in the position shown in sketch No. 2, because each part of his body will have rotated through the angle $360° - 180°$ which is $180°$.

W. S. FRANKLIN

HOW TO THROW A CURVED BALL

TO THE EDITOR OF SCIENCE: I have tried a great variety of devices for throwing a curved ball for class-room demonstration, but with only moderate success, and I have tried in vain the method suggested by Professor J. J.



Thomson for causing a rubber balloon to travel in a sharply curved path. A year ago, Professor J. H. Wily suggested a method which is extremely satisfactory, as follows:

[1] This factor is not a moment of inertia in the usual sense of that term; but it is expressible in terms of the same unit.

A light ball of pith or cork or a ping-pong ball covered with varnish and rolled in fine sawdust is placed in a round pasteboard mailing tube and thrown by a quick motion of the tube as indicated in the accompanying sketch. The ball rolls along one side of the tube and is spinning rapidly when it leaves the end of the tube. The result is that the ball curves sharply upwards as it flies through the air, in some cases describing the cusped curve which is mentioned by Professor J. J. Thomson.

W. S. FRANKLIN

SEED DISTRIBUTION BY SURFACE TENSION

IN response to Mr. Becker's suggestion in SCIENCE, November 17, I may record what I have been accustomed to state in public concerning the distribution of seeds of water lilies (*Nymphæa* (L.) Sm.). Indeed, I was surprised to find that the observation had not already been published.

The fruits of *Nymphæas* mature under water, and burst irregularly, discharging the seeds a few inches or feet below the water surface. But the seeds rise at once and float by reason of a buoyant aril. The aril forms a kind of double-walled sac, open at one end, and enclosing the seed. It is mucilaginous in character and carries little bubbles in and upon it. I have often watched a mass of such seeds of *N. odorata, N. cærulea* or *N. lotus* upon a water surface. They separate from one another spontaneously and distribute themselves over the tank or pond in all directions, even though both water and atmosphere be perfectly still. It is wonderful how they steer about among floating leaves, and travel to the confines of their basin. Each one seems to repel all others. I have always believed this was due to surface tension or diffusion effects, but have never undertaken to prove the point or to determine the substances causing it. After some hours, the aril splits, the pieces curl up, and the heavy seed is released and sinks to the bottom of the pond.

HENRY S. CONARD

GRINNELL COLLEGE,
GRINNELL, IOWA,
November 20, 1911

MODELS OF VORTICELLA AND CYCLOPS

TO THE EDITOR OF SCIENCE: The Department of Animal Biology of the University of Minnesota recently received a model of a small colony of *Vorticella* and a model of *Cyclops* that deserve public notice.

These models are advertised in reputable catalogs and the stands bear printed labels that announce:

Awarded Gold Medal, Franco-British Exhibition, 1908

Biological Models. Made by Smedley, London, S. E.
Sole Agents, Gallenkamp & Co., 19 and 21 Sun St., Finsbury Square, London, E. C.

The models are made of a soft paraffin and are, without qualification, the poorest models that I have ever known to be advertised and for sale. They are absolutely devoid of any scientific value and are grossly untrue to even the most evident structural features. The appendages of the *Cyclops* (sp.?) are uniramous and no attempt has been made to indicate the relative lengths of the joints. Even the number of joints differs in the members of a pair. There is no attempt to represent the vestibule or "disk" of the *Vorticella* and the cilia are represented by feathers pressed into the paraffin. The paraffin is very slovenly put over wires and everything about the models indicates very crude workmanship and lack of knowledge. And such things are awarded gold medals!

This is submitted for the protection of those disposed to use models in the class room and the laboratory.

HENRY F. NACHTRIEB

SIPHON SPRINGS AND SINK HOLES

Siphon Springs.—Intermittent springs as the result of the combination of a reservoir and siphon have long been favorite illustrations in the standard text-books of physics to show the practical application of the siphon. The familiar figure shows a small hill with a large cavern discharging its water by means of a siphon. Such a cavern emptying into a valley in this way must be extremely rare in