The Tippe Top Again

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Satterly told how he was able to produce them by what appeared to be cavitation in the water faucet. A simple and interesting experiment, probably known to many of the readers, to show the bubbles produced by cavitation can be done by merely letting the tap water flow through a section of glass tubing that has been drawn out to contain a constriction. At low rates of flow the water passes through the low pressure region at the constriction with no visible effect but as the flow rate is increased a point is reached where cavitation can be observed by the formation of a dense cloud of minute air bubbles. The appearance of the bubble cloud is accompanied with an audible rattle and vibrations of the glass tubing. The water downstream from the constriction appears slightly whitish in color and if this water is collected in a beaker the micron sized bubbles may be observed.

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[1] J. Satterly, Am. J. Phys. **23**, 387 (1955).
[2] A. H. Woodcock, J. Meteorol. **9**, 200–212 (1952).
[3] Kientzler, Arons, Blanchard, and Woodcock, Tellus **6**, 1–7 (1954).
[4] D. C. Blanchard, Nature **175**, 334–336 (1955).

Comment on Standing Tiptoe

IN a recent article, Richard M. Sutton[1] described a parlor trick in which a person stands facing the edge of an open door with nose and stomach touching the edge and feet extending forward slightly beyond it and then tries to rise on tiptoe. It is impossible because the door prevents him from shifting his weight forward. Unfortunately, one who proposes such a stunt may be challenged to do it himself. If this should happen, I recommend carrying a weight of ten pounds or more in each hand "to make it even harder." After taking position facing the edge of the door, swing the arms forward and hold the weights in front of you. Now even an overweight and overage physicist should be able to rise to the occasion.

[1] R. M. Sutton, Am. J. Phys. **23**, 490 (1955).

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The Tippe Top Again

MR. Del Campo's note[1] on the mechanics of this toy makes a useful contribution by furnishing a simple argument for the role of friction in the process of inverting the top. An even simpler, purely qualitative consideration can be added to show that the torque produced by friction is in the right direction to bring about the observed result.

Assume, for example, that the top is initially set spinning, stem upward, with clockwise rotation as seen from above. Then, according to the right-hand screw rule, the corresponding angular momentum vector is to be taken in the downward direction. After the top succeeds in turning itself over, this vector will be in the upward direction.

This means that the change in angular momentum must be represented by a vector in the upward direction, and this is true whether or not any decrease of rotational speed of the top is taken into account. According to Newton's second law for rotation, the torque vector that caused this change in angular momentum must also be directed upward. But this implies the existence of an upward-directed torque; and friction with the table, since it acts in the sense contrary to the spin, is precisely where this torque comes from.

The same conclusion is reached if the top is initially spinning in the counter-clockwise direction.

[1] Am. J. Phys. **23**, 544 (1955).

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Surface Tension and Floating Bodies

IN the discussion of surface tension as presented in most texts on general physics there is found some reference to insects skating on water film and to the floating of a needle or a razor blade on water. In some cases the whole support is attributed to the vertical component of surface tension. In no text has the writer found any reference to Archimedes' principle of flotation in this discussion. It is interesting to perform the following experiment which gives some indication of the relative importance of these two effects.

Drop a thin double-edged razor blade on the surface of some fresh water and increase the load by one blade at a time until it sinks. With care it has been found that a pile containing as many as eight blades can be supported on the surface. Taking surface tension of water as 72 dynes/cm and the length of outer edge of the blades as 13 cm one finds that even if the film makes an angle of contact of 0° with the edge of the pile, the vertical component would be only 936 dynes. The eight blades, however, weigh about 4400 dynes. Hence the support given by surface tension could not be more than 21% of the weight. Examination shows the film is depressed for some distance below the surface of the water. From this it seems that the total displacement produced by floating objects accounts for most of their support on a water surface.

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On the History and Philosophy of Science. A Reply

PROFESSOR Holton, while supporting my plea[1] for the introduction of history and philosophy of science into the educational program of the physicist, disagrees with my contention that the main place for such studies is in the graduate curriculum rather than in the less advanced stages of the physicist's training.[2] Professor Holton will probably be the first to agree with me that the general introduction of history of physics at all levels is at present greatly hampered by the limited number of physics instructors who take an interest in the history of physics. Thus if we wish to improve this situation, the logical way