

## Hertzian Contact and Adhesion of Elastomers<sup>1</sup>

**J. J. Bikerman.**<sup>2</sup> When a glass lens is being lifted from a nitrile rubber, air has to enter the space between the two. This flow of air takes time so that the separation is not instantaneous and is slower the smaller the applied tensile force  $P$ , see Fig. 6 of the original. Thus only *apparent* adhesion, as the effect was named by Stefan,<sup>3</sup> was observed in the author's experiments. Stefan's equations relate the rate of separation to  $P$  for two-plane parallel plates. It is hoped that the author will derive a suitable equation for his system.

It may be added, for historical accuracy, that the concept of

<sup>1</sup> By R. C. Drutowski, published in the October, 1969, issue of the JOURNAL OF LUBRICATION TECHNOLOGY, TRANS. ASME, Series F, Vol. 91, No. 4, pp. 732-737.

<sup>2</sup> Horizons, Inc., Cleveland, Ohio.

<sup>3</sup> Stefan, J., Sitzber. Akad. Wiss. Wien, math.-naturw. Kl. Abt. II, Vol. 69, 1874, p. 713.

apparent adhesion caused by air flow was mentioned first by Galileo.<sup>4</sup> For a recent review see, for instance, the book by the discussor.<sup>5</sup>

### Authors' Closure

I would like to thank Mr. Bikerman for his interest and comments. Essentially, the validity of the method of adhesion measurement described in the paper is based on the static equilibrium between the adhesive force, the elastic restoring force, and the external force, and does not depend on the air flow that Mr. Bikerman is worried about.

In observing the decrease of contact size with time under certain load conditions, the constancy of adhesive strength has been emphasized. From the nature of the adhered Hertzian contact stress distribution, decay is natural and rupture occurs under predictable circumstances. Any "apparent" adhesion due to air flow would not appear to be significant for this configuration.

<sup>4</sup> Galileo, G., *Two New Sciences*, p. 11, Dover, New York.

<sup>5</sup> Bikerman, J. J., *The Science of Adhesive Joints*, Academic Press, New York, 1968, p. 92.