fraction of the static friction between two clean, smooth glass surfaces in contact is due to molecular attraction between those parts of the surfaces which are so close to one another that their molecular adhesions come into play. This assumption would explain both the formation of the observed microscopic pits and the decrease in friction with decreased smoothness of the surfaces. If this interpretation applies to all friction between smooth, solid surfaces it would indicate that the friction is largely determined by the molecular attractions between the two surfaces in contact and by their mean distance apart.

G. W. HAMMAR
GORDON MARTIN

THE UNIVERSITY OF IDAHO

THE CONSCIENCE OF THE PAST AND THE PRACTISE OF THE PRESENT

INCREASING awareness among scientists of the barbaric uses to which their discoveries and inventions have so frequently been put—and in many cases are at the present time threatening the destruction of millions of human beings—has caused many scientists somewhat belatedly to take thought how best they can in future prevent such misuse of their labors. In our own day one of the greatest mechanical inventions of this or any other century, the aeroplane, has been turned into an instrument which power-crazed governments use to threaten not only the peace but the civilization of the world. It is therefore of peculiar interest for us to-day to hear what the inventor of the first airship, Father Francesco Lana (1631–1687), considered to be the strongest objection to his invention.

After enumerating the six technical objections which he foresaw to his invention (actually in his poverty he was unable to construct the ship), he goes on to say:

> Other Difficulties I see not, which may be objected against this Invention, besides one which to me seems greater than all the rest, and that is, That it may be thought, that God will never suffer this Invention to take effect, because of the many consequencies which may disturb the Civil Government of men. For who sees not, that no City can be secure against attack, since our Ship may at any time be placed directly over it, and descending down may discharge Souldiers; the same would happen to private Houses, and Ships on the Sea: for our Ship descending out of the Air to the sails of Sea-Ships, it may cut their Ropes, yea without descending by casting Grapples it may over-set them, kill their men, burn their Ships by artificial Fire works and Fire-balls. And this they may do not only to Ships but to great Buildings, Castles, Cities, with such security that they which cast these things down from a height out of Gun-shot, cannot on the other side be offended by those below.

This passage occurs in the author's "Prodromo," which was published in 1670. The first account and criticism of this work in English (probably by Robert Hooke) appeared in the *Philosophical Collections,* No. 1, 1680, pp. 18–29, and it is from this account that the translation given above is reproduced.[1]

M. F. ASHLEY-MONTAGU
HAHNEMANN MEDICAL COLLEGE,
PHILADELPHIA

SCIENTIFIC BOOKS

SCIENCE IN AFRICA

Science in Africa. By E. B. WORTHINGTON. New York: Oxford University Press, 1939. Pp. xv + 746. Illustrated. Maps. $4.00.

LORD HAILEY, the director of the African Research Survey, writes in the Foreword:

> This book is one of a series of reports prepared in connection with the African Research Survey. The problems of Africa, as they present themselves to those whose concern is with the development of the continent, are discussed in "An African Survey." The purpose of this volume is to summarize the present position of studies in the various sciences which have a bearing on African conditions.

Mr. Worthington starts in by pointing out the interrelations between branches of science, and then as an aid to the appreciation of the interdependence of scientific studies in Africa he mentions important points about the changing environment. For example, he says, "The picture really presented by Africa is one of movement, all branches of physical, biological and human activity reacting on each other, to produce what biologists would refer to as an ecological complex."

Mr. Worthington's first chapter deals with some problems of research in which he makes many practical suggestions arising from his investigations; for example, he points out the practical advantages of separating research organization from the executive

[1] A contemporary English translation of the relevant fifth and sixth chapters from the "Prodromo" is "The Aerial Ship, by Francesco Lana." The Aeronautical Society of Great Britain, London, 1910, 12°, pp. vi–7–27. The following are the studies which I have thus far been able to discover relating to Francesco Lana's invention: Wilhelm Balthasar, "An der Wiege der Luftschiffart. Francesco Lana und Barthol. Laurenço de Gusmao." *Frankfurter Zeitgemässe Brorchüren,* Hamm, Vol. 28, pp. 137–198, 1909; Anton von Brandis, "Studien über die Verfassungs-Geschichte der Gemeinde Lana," *Zeitschrift des Ferdinandeums für Tirol und Vorarlberg,* 3 Folge, Heft. 18, pp. 159–196, (Geschichtliche Abtheilung), Innsbruck, 1873; Angelo Ferretti-Torricelli, "Padre Francesco Lana nel terzo centanario dalla nascita," Ateneo di Brescia. Commentari, Brescio, 1931/32, pp. 331–390. See also Francesco Lana Terzi, *Magisterium Naturae, et Artis,* Brixiae, Libri 3, (1) 1684, (2) 1686 and (3) 1692.