The point of this discussion is to bring out the inadvisability of introducing terms into the literature which tend to add confusion where simplicity is not, unfortunately, one of its virtues. If the concept is one of simplifying nature, it should be incorporated into biochemical texts. Can the added advantage (?) of NF over N in quantitative analysis be included in this category?

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Rockets vs. Meteoroids

Rockets used for exploration of the atmosphere and possibly of interplanetary space must run the risks of destruction through collision with meteor-forming particles. As it is now possible to send rockets into the upper atmosphere, where collisions may occur, it is of some importance to survey the chances of such collisions.

A meteor, or more popularly a "shooting star," occurs when a small solid particle, or meteoroid, weighing a few milligrams dashes into the atmosphere with a velocity between 20 and 70 km./sec. When at these velocities an atmospheric atom or molecule collides with the meteoroid, a few atoms of the particle are chipped off and fly out with considerable kinetic energy which, through successive collisions with other atoms, is transformed into radiation. When collisions between the particle and atmospheric atoms become sufficiently frequent, the cylindrical cloud of hot gas formed around the path of the particle is observed as the "meteor." The great majority of meteors are first visible at heights between 100 and 115 km. How deeply they penetrate the atmosphere before being consumed varies with the mass of the particle; few, however, remain visible below 65 km.

At heights below 65 km. the chances of collision between a meteoroid and a rocket are very small, for few meteoroids are present. Above 85 km., however, a rocket is exposed to possible collision with the steady hail of particles. If a particle is checked abruptly, it will vaporize, explode, blow a hole in the rocket, and very likely destroy it.

The earth's daily catch of particles producing meteors bright enough to be seen by the unaided eye is usually estimated as around 24,000,000. Counts of telescopic meteors too faint to be observed with the unaided eye indicate that the total number of meteoroids impinging daily upon the atmosphere is much greater. The results of the Arizona Meteor Expedition (*Harvard Observ. Ann.*, 1937, **105**, No. 32) and my own observations (*Proc. Amer. phil. Soc.*, 1939, **81**, 493) indicate that down to the ninth magnitude the daily total is about a billion: 10^9. Even this figure, which does not include very faint meteors, is certainly too small, but it can be used for some enlightening calculations.

The total area of the earth's atmosphere is about 5×10^8 sq. km. If 10^9 meteors enter it each day, the frequency per square kilometer is about two particles daily. Let us assume that the cross section of a typical rocket is 5 sq. m. Then, on the average, one meteor will pass through a "rocket-sized area" once in 10^5 days; or such a patch of atmosphere will be pierced by a meteor sometime during one day in each 300 years.

It is probable that the total number of meteoroids entering the atmosphere daily is at least a thousand times greater than 10^9. Even so, at a daily rate of 10^{12} particles, a rocket-sized area will be pierced by a meteoroid only once each 100 days. Inasmuch as a rocket used for high-altitude soundings will be exposed to collision at the top of the atmosphere for only a short time, there is very little chance that such a rocket will be struck.

Rockets fired toward the moon will be traveling for some time. Let us assume that the fuel capacity of a rocket limits its extra-atmospheric velocity to 1 km./sec. As the average distance to the moon is 384,000 km., a rocket traveling the shortest path would require nearly four and one-half days for the trip. It seems, therefore, that some appreciable fraction of rockets shot toward the moon (4 per cent for the conditions assumed here) would be destroyed.

Interplanetary travel constitutes the most hazardous journey for the rocket enthusiast. Of all the planets, Venus comes the closest to the earth, reaching a minimum distance of 42,000,000 km. If an interplanetary rocket traveled a mere kilometer per second in space, it would require nearly 500 days to reach Venus. While existing information on the space density of meteoroids is uncertain within rather wide limits, it seems probable that a sizable proportion of space ships would not survive exposures of several hundred days to the hazards of collision with meteoroids. By the time space ships are built and the other details of interplanetary travel are settled we may have means of fending off or of dodging the oncoming particles. Certainly by then more precise information should be available on the total number of particles striking the atmosphere daily.

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Rediscovery in the Vitamin C Field

Apropos of the series of articles dealing with rediscovery in the vitamin A field (*Science*, 1946, **103**, 175, 281, 404), it is with bowed head that we report the existence of a similar situation in the vitamin C field. At the February 1945 meeting of the Société Belge de Biologie, in Brussels, G. Barac and one of the undersigned (Roseman) reported what we believed to be a new color reaction between vitamin C and titanium salt, similar to that obtained (and well known) with hydrogen peroxide and titanium salt. Work dealing with this and related observations (*C. R. Soc. Biol. Paris*, in press) was done in the laboratory of L. Brull at the Bavière Hospital of the University of Liége, during the period December 1944 to February 1945. Liége was being rocked and destroyed by flying bombs, and there were the menacing days of the enemy's Ardennes break-through. We regret that, despite our general knowledge of the chemical literature on titanium and vitamin C and our actual search of the literature available to us at the time, we nevertheless missed an article by J. Ettori, published just 10 years ago (*C. R. Soc. Biol. Paris*, 1936, 202, 852), wherein is described a reaction similar to the one reported by us at Brussels.

Might we add a word of high praise for such men as Prof. Brull, Prof. Gillet, Dr. Lambrechts, Dr. Barac, and their Belgian colleagues at the University of Liége who, in the face of many dangers and personal disasters, bravely continued their scientific researches throughout the war, and who, with their families, extended every kindness and courtesy to the American soldier and scientist.

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The Occurrence of Crystalline Naringin on Grapefruit Rind

Naringin ($C_{27}H_{32}O_{14} \cdot 2H_2O$), the glucoside which imparts the characteristic bitterness to grapefruit, was first discovered by DeVry in 1857 (*Jb. Pharmacog*, 1857, 132, 1866). According to Poore (*Ind. eng. Chem.*, 1934, 26, 637), when grapefruit is stored, the content of naringin appears to diminish in both the peel and the juice.

Not long ago the writer's attention was called to aggregates of crystalline material that had collected on the surface of grapefruit rind, a cursory examination of this crystalline material indicating that it closely resembled naringin. The sample of grapefruit examined had been in the laboratory for some time and was gradually decomposing. Due to the pressure of other duties at the time, no more attention was paid to the exhibit, although a record of preliminary observations was made. More recently, opportunity was afforded for repeating the test for the purpose of definitely confirming the results heretofore casually observed. For this purpose a one-half portion of a grapefruit was placed, cut side down, under a bell jar, the latter not resting tightly over the fruit but on glass supports to permit ingress of air. The cut portion soon became inoculated with *Aspergillus niger* (Cramer) Van Tieghem. (The writer is indebted to John F. Reed, Baldwin-Wallace College, Berea, Ohio, for this identification.) In the course of 10 days, the growth of the *Aspergillus* was quite considerable, the fruit was rapidly decomposing, and there was formed on the surface of the rind numerous yellowish-white aggregates of material. These could be readily removed with a needle to an object slide and allowed to dry at room temperature.

The dried, yellowish-white masses, upon microscopic examination with crossed nicols, consisted of narrow rods and needles showing parallel extinction and negative elongation. The significant refractive indices as determined by the immersion method were: $\alpha = 1.480$ (shown lengthwise), $\beta = 1.625$ (shown crosswise), $\gamma = 1.668$ (shown crosswise)—all ± 0.002. These optical crystallographic data all agreed with those characteristic of naringin obtained from grapefruit and Florida and California oranges.

The fact that naringin crystallizes out on the rind of the grapefruit as it decomposes is of interest. The objective evidence indicates that conditions were suitable for the occurrence of these aggregates, although it has not been demonstrated that the increasing growth of the *Aspergillus* was necessarily wholly responsible for it. Both the changes initiated by the progressive development of mold growth and the general chemical decomposition of the fruit might have some effect on the appearance of the glucoside on the rind in crystalline form.

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Book Reviews

Rockets. Robert H. Goddard. New York: American Rocket Society, 1946. Pp. xix + 69; 10. (Illustrated.) $3.50.

Dr. Goddard is well known as a pioneer, if not the pioneer, of modern rocketry. Unfortunately, this book is not, as the title might indicate, a general discussion of the principles or accomplishments of rocketry but simply a reprinting of two Smithsonian Institution publications of the author—apparently his only publications in the field.

While an historical service is unquestionably performed in making available these out-of-print publications of the "father of modern rocketry," the dates of their original publication (1919 and 1936, respectively) and the tremendous development of rocketry in the last few years make it unreasonable to expect any great scientific value to accrue to the present-day reader.

The earlier and by far the longer paper is entitled "A Method of Reaching Extreme Altitudes" and gives a discussion of the possibility of using (sounding) rockets for the exploration of the upper atmosphere. It includes a presentation of Dr. Goddard's early experimental determinations of the gas velocity of smokeless powder rockets and a computation of the weights required to reach various extreme altitudes (125,000 feet and up).

The entire paper exhibits a rather odd blend of farsightedness and a surprising scientific naïveté. The soundness of the basic conception, that a rocket provides a practical means of attaining extreme altitudes, has been amply demonstrated by now. In addition, the extreme importance of a high gas velocity and a high ratio of fuel to empty weight is properly emphasized. Other suggestions presented in this 1919 paper which have subsequently proved of value include the idea of a multistage