the nature and biological activity of its components.

The citrus flavonoid complex was separated into three fractions by differential solubility in methanol and ethyl acetate.

One hundred grams of citrus flavonoid complex (*3*) was added to 1 liter of methanol, stirred for 1 hour at room temperature, and filtered on a sintered glass Buchner funnel. The insoluble material was washed with 100 ml of methanol, and when dried in a vacuum at 60°C resulted in 35 g of dark brown powder (fraction I). The combined methanol filtrate and washing, after concentration to approximately 300 ml under reduced pressure, was added to 5 volumes of ethyl acetate. After stirring for 15 minutes the mixture was filtered; the insoluble material after it had been washed with 100 ml of ethyl acetate and dried in a vacuum at 60°C, was a light brown powder weighing 29 g (fraction II). The combined ethyl acetate filtrate and washings were concentrated under reduced pressure to approximately 50 ml which, when dried in a vacuum at 60°C, was a yellow powder weighing 32.7 g (fraction III).

Each of the fractions and the untreated flavonoid complex were assayed for anti-inflammatory activity by the modified (*5*) method of Ungar (*6*). Sixty-five percent of the anti-inflammatory activity of the starting material was concentrated in fraction III (*7*). When inflammation was produced by either inflammatory exudates or leukotaxin, the citrus flavonoid complex displayed a broader inhibitory potential than either cortisone or ACTH (*8*).

Chromatography on Whatman No. 3MM paper with the mixture of four parts of butanol, one part acetic acid, and five parts water (BAW) as the aqueous phase separated fraction III into six components which fluoresced in ultraviolet light with R_F values of 0.12, 0.18, 0.39, 0.54, 0.71, and 0.84. Only the component at R_F 0.84 gave a typical flavanone reaction when sprayed with the sodium borohydride reagent of Eigen (*9*).

Fraction III was then fractionated to yield hesperidin, naringin, and relatively small amounts of 5,6,7,8,3′,4′-hexamethoxyflavone (nobiletin), a pentamethoxyflavone isomeric but not identical with tangeretin, and an unidentified component (RS–1) with reducing properties, and an R_F 0.71 in BAW.

Increased capillary permeability is the basic initial manifestation of inflammation, and practically all the methods devised for measuring inflammation have been based on the loss of plasma into the inflamed tissue. The various techniques have been discussed by Ungar (*10*) who has presented a new method of bio-assay based on the direct measurement of the edema formation characteristic of acute inflammation. This method, which is reproducible and reliable for the quantitative evaluation of anti-inflammatory activity, was used to assay the components of fraction III (Table 1). One unit of potency (ED_{25}) is the weight of test substance per kilogram weight of guinea pig producing a 25-percent reduction of edema. The results demonstrate that there are in citrus peel extracts factors acting to inhibit increased capillary permeability, that these factors are distinct from hesperidin or naringin, and that the amount varies according to the methods of extraction and preparation employed.

Unfortunately, the designations "bioflavonoids," "citrus bioflavonoid complex," "citrus bioflavonoids," and similar terms are applied interchangeably in the experimental and clinical literature to materials of diverse origin, purity, identity, and biological activity. Thus even in a critical review (*11*) the implication has been that results obtained with any flavonoid are applicable to all flavonoids as a class. Evaluation of the biological activity of flavonoid preparations by the procedure of Ungar (*10*) would differentiate between them according to anti-inflammatory activity and could add considerably to the clarification of the utility of "bioflavonoids" in humans.

However, further work is necessary to elucidate the relationship of the demonstrated effects of biologically active flavonoids in laboratory animals to their clinical effects in humans, particularly in view of the species differences in absorption and metabolism of these substances (*12*).

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26 October 1962

Meteorite with Unique Features

Abstract. *A brief account of the discovery in Luzon, Philippines, of a large meteorite that does not fit into any of the currently used classifications is presented; together with results of preliminary studies of its unprecedented structure, specific gravity, and multiple magnetic polarity. Its probable terrestrial age is also discussed.*

A 1955-lb meteorite of unique structure has been recovered from a remote location in the Bondoc peninsula on southern Luzon Island in the Philippines (Fig. 1).

The meteorite was located during our visit to Manila in 1958 through information obtained from the National Bureau of Mines in Manila. The Bureau had received a small sample, but was not interested in pursuing an investigation. The specimen, together with meager information, was then turned over to us; since that time we have been working through a local field party for its recovery.

The first sample was a badly oxidized nickel-iron nodule weighing 684.1 grams with a specific gravity of 7 plus. Later samples from the field ranged from 3.26 to 6.35 in specific gravity with an average of 3.94. All local geologists and mining men called them "low-grade iron ore" and not meteoritic. It was felt that this was a very unusual meteorite and efforts to recover it were intensified. These were successful, and the meteorite arrived in Sedona, Arizona, on 10 August 1962 (Fig. 2).

A section measuring 71.2 by 43.8 cm was cut from near the small end of the generally oval-shaped mass. This cut

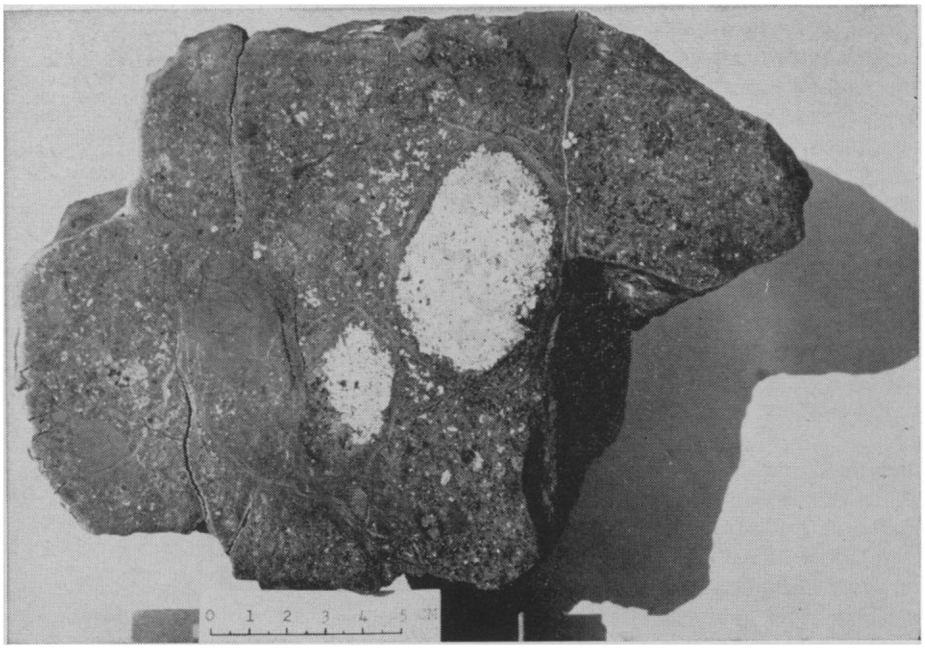

Fig. 1. Polished section through a fragment of the Bondoc meteorite which shows one large and one small nickel-iron, chondrule-like nodule.

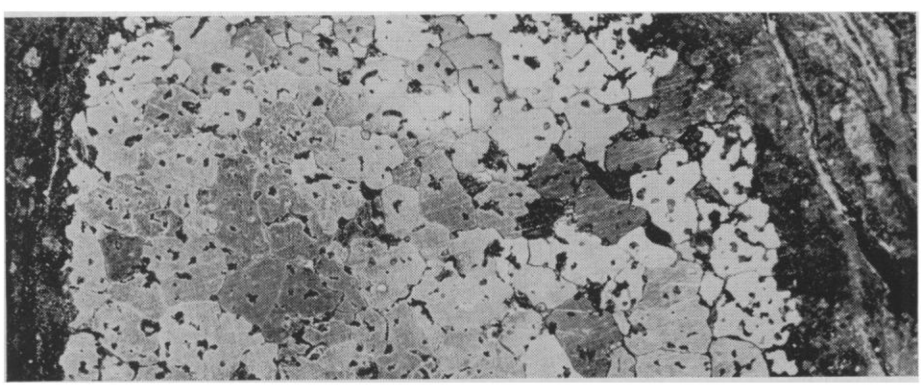

Fig. 2. Enlarged polished section of nickel-iron nodule.

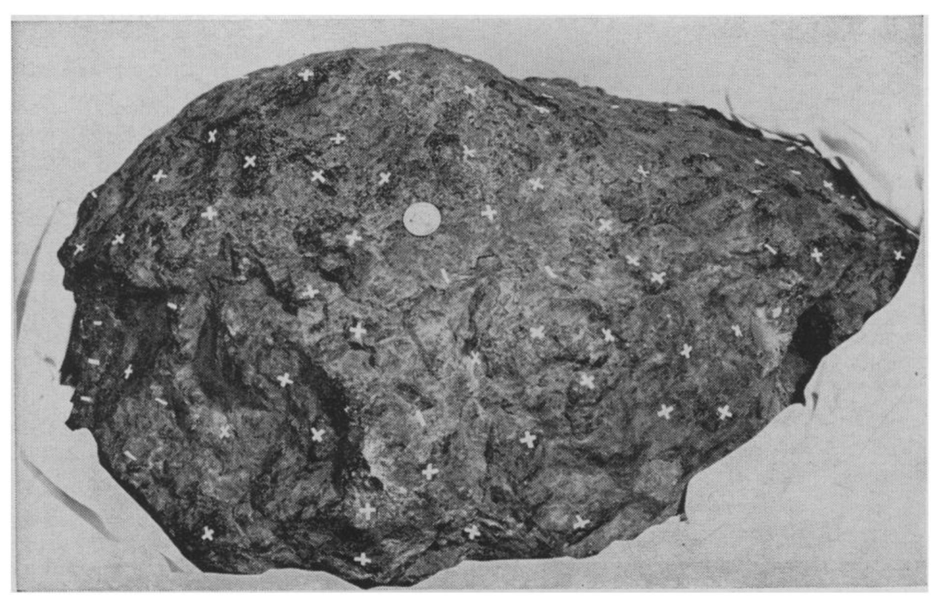

Fig. 3. North and south poles of magnetic fields are marked with crosses and bars, respectively.

showed 15 large nickel-iron chondrule-like nodules similar to those described by Brezina in the mesosiderite from Mincy, Mo. (1895). The Luzon specimen, however, is an aerolite, most of which is free of metallics. Those present are all located in an outer zone surrounding a roughly rectangular block of what appears to be pure crystalline enstatite measuring 22 by 15 cm, within which Carleton Moore and I could find no trace of metal. The zone surrounding the metallic chondrules, of which the largest measures 7 by 4 cm, seems on casual inspection, to be a mineralogical complex of enstatite, olivine, and other unidentified minerals.

A remarkable feature of this meteorite is its multiple magnetic polarity. More than 90 each of positive and negative poles have been located without investigating the under surface of the stone (Fig. 3). Each pole exercises the compass needle much more energetically than the two poles found on the many meteorites that I have previously tested.

A sample from the surface of the stone was submitted to Edward Anders of the Enrico Fermi Institute of the University of Chicago for an estimate of terrestrial aging. His report is as follows:

"The Al^{26} content of Bondoc, as measured by γ-γ coincidence spectrometry, is 5.0 ± 1.7 disintegrations per minute per kilogram, compared to about 54 dpm/kg for an average chondrite. This low activity may be due to any of the following three causes, acting singly or in combination.

"1) Short cosmic-ray exposure age. If the pre-atmospheric mass of the meteorite was not much greater than its present mass, the low Al^{26} content may indicate an exposure age as short as 100,000 to 40,000 years.

"2) Long terrestrial age. Assuming negligible shielding and a long exposure age (greater than a few million years), the low Al^{26} content may be attributed to decay since the time of fall. The meteorite must then have fallen 2.5 ± 0.3 million years ago.

"3) Shielding. Assuming a long exposure age and a short terrestrial age, one can attribute the low Al^{26} content to shielding. If the recovered mass of Bondoc came from the center of the meteoroid, the pre-atmospheric mass must have been at least as great as 6 tons, and may have been greater if Bondoc was located closer to the surface."

A mineralogical analysis of the meteorite is now being made by C. Moore, curator of the Nininger Meteorite Collection at Arizona State University. It appears that this specimen must be classified in a new subclass of the aerolite group.

The meteorite will bear the name Bondoc, a station on the Bondoc peninsula that appears on the latest map of Luzon Island.

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15 November 1962

Fine Structure of the Interpseudotracheal Papillae of the Blowfly

Abstract. *Electron-microscope studies of the interpseudotracheal papillae of the blowfly* Phormia regina *(Meigen) revealed that each papilla contains four nerve fibers. The nerve fibers are encased in a cuticular sheath located in the lumen of the papilla inside the vacuole of the trichogen cell.*

During a recent study of the fine structure of the chemoreceptors on the labellum of the blowfly *Phormia regina* (Meigen) (*1*) an opportunity arose to observe the interpseudotracheal papillae of the blowfly with an electron microscope.

The interpseudotracheal papillae are minute sensilla basiconica which project through the syndesmoses between the pseudotracheal and the interpseudotracheal plates on the oral surface of the labellum. According to Dethier (*2*) there are from 135 to 189 of these papillae on the labellum of the fly. The papillae are 10 μ long, 5 μ in diameter at the base, and 2.5 μ in diameter at the tip.

Some of the earlier workers—Kraëpelin (*3*), Hewitt (*4*), and Graham-Smith (*5*)—claimed that the structures are gustatory, and Graham-Smith (*5*) suggested that they have an additional tactile function. Dethier (*2*) described the morphology of the sensillum and the relationship between the distal nerve fibers and the papilla, confirming some of the earlier observations of Kraepelin (*3*) and others.

While earlier workers were aware of the distal nerve fibers they made no attempt to relate them to the papilla itself. Dethier (*2*), employing methylene blue and silver preparations, detected two distinct nerve fibers and suggested the possible existence of a third nerve fiber.

In the study of the blowfly labellum with the electron microscope (*6*), a number of interpseudotracheal papillae were observed in section. The cuticular portion of the sensillum consists of a peg surmounting a broader base with a sclerotized annular area. The peg itself is heavily sclerotized. The lumen of the peg is an extension of the vacuole of the trichogen cell. The nerve fibers extend up through this vacuole into the peg. The nerve fibers, however, are completely isolated from the cytoplasm of the trichogen cell by a dark cuticular sheath which surrounds each nerve fiber (Fig. 1).

In the labellar hairs the cuticular sheath around the nerve fibers does not extend into the lumen of the hair itself but terminates at the base of the hair shaft (*1*). In the papillae the cuticular sheath does extend well up into the lumen of the sensillum (Fig. 1). In the labellar hairs the cuticular sheath is seen as an invagination between but not completely surrounding the nerve fibers (*1*), while in the papillae the cuticular sheath completely encloses each nerve fiber.

In the labellar hairs the cuticular sheath probably is responsible for the formation of the double-walled structure observed in the chemoreceptors, which maintains the separation between the nerve fibers and the cytoplasm of the trichogen cell (*1*). In the papillae the cuticular sheath serves the same function, but it is not fused to the wall of the papilla. It remains in the lumen of the peg, where it is surrounded by the vacuole of the trichogen cell. This situation is similar to that which was observed by Slifer *et al.* (*7*) in the grasshoper.

The cuticular sheath, which extends from the base of the papilla up through the lumen, is probably what Dethier (*2*) described as the inner sclerotized annular area lying within the sensillum.

In all of the papillae observed there were always four nerve fibers, each fiber being separately enclosed in the cuticular sheath. These fibers may be seen in the cross section of a typical sensillum basiconicum (Fig. 1).

The neurons lie in the epidermal cell complex 30 to 40 μ below the cuticle. Associated with the nuerons at this level are two larger cells which are

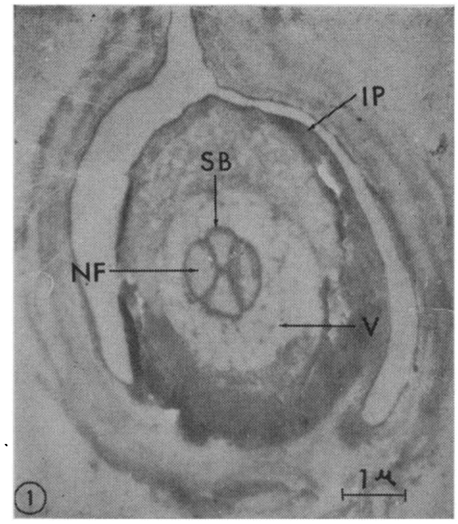

Fig. 1. Section through an interpseudotracheal papilla (*IP*). Note the four nerve fibers (*NF*) enclosed in the cuticular sheath (*SB*) situated in the lumen of the peg. The nerve fibers in the cuticular sheath are completely surrounded by the vacuole (*V*) of the trichogen cell.

probably the trichogen and tormogen cells. The epidermal cell complex associated with each sensillum basiconicum has not as yet been studied in great detail with the electron microscope. The proximal fibers from the nerve cell bodies of all the sensilla join to form a branch of the labial nerve; this branch, in turn, goes to the subesophageal ganglion.

The relationship of the nerve fibers to the tip of the peg has not as yet been observed. Slifer (*7*) has shown in grasshoppers, and Adams (*8*) has shown for *Stomoxys*, that the distal processes of the nerve fibers extend to the extreme tip of the chemoreceptors, where they are exposed to the atmosphere through a small pore. Whether this holds true for the sensilla basiconica of the blowfly *Phormia regina* still remains to be seen.

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