mined temperatures by first assuming that all of the 12-μ radiation was thermal emission from the dark side and that all of the 8.6-μ radiation was thermal emission from the crescent. A method of successive approximation was then applied. Using intensities uncorrected for mirror defocusing leads to best fit temperatures of 109°K for the dark side and 194°K for the crescent. The corrected average dark-side temperature is 111°K, and the corrected average crescent temperature is 205°K. The dark-side temperature is much better determined than the effective temperature of the crescent. Our value of the dark-side temperature is in agreement with the prediction of Morrison and Sagan (*2*).

The curve for scattered sunlight is drawn through the experimental points (Fig. 2) and gives an albedo for Mercury that is a factor of 2 less than that expected on the basis of an observed visual magnitude of +3.4 and the sun's color index (*3*). This effect could be due either to a real change in Mercury's albedo between visible and infrared wavelengths or to the fact that we were beam-switching against the zodiacal light which should have the same color index as the sunlight scattered from Mercury. Whereas our other measurements were made with a signal-to-noise ratio of up to 5 to 1 (see Fig. 3), our 4.8-μ measurement was made with a signal-to-noise ratio of 1 to 1 and can properly be called only an upper limit. At an elongation angle of 3° coronal brightness is 1.2×10^{-10} the sun's surface brightness (Fig. 4) (*4*). Therefore, for our beam diameter of 13 seconds the intensity of the F corona or zodiacal light at 5 μ is 9×10^{-12} μwatt cm^{-2} μ^{-1} or about 1/20 of our measured 4.8-μ intensity (*5*). Under more favorable conditions it may be possible to detect the zodiacal light as an "antisignal."

According to our measurements, the average dark-side temperature of Mercury is 111° ± 3°K. Comparison of this average temperature with theoretical models requires that the thermal inertia, $(\kappa\rho c)^{\frac{1}{2}}$, (where κ is the thermal conductivity, ρ is the density, and c is the specific heat), of the surface be 0.0014. Mercury and the moon therefore appear to have very similar top surface layers (*6*).

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Archaeopteryx: Notice of a "New" Specimen

Abstract. *A fourth specimen of* Archaeopteryx *(cf.* lithographica), *the oldest known fossil bird, was recently found in the collections of the Teyler Museum in the Netherlands. Unique preservation of the horny sheaths of the manus claws provides new evidence that may be relevant to the question of the origins of avian flight. Tentative interpretation suggests a cursorial rather than arboreal origin.*

The most persuasive evidence for a reptilian ancestry of birds rests in the few known fossil specimens of *Archaeopteryx* from the Late Jurassic (Middle Kimmeridgian) Solnhofen limestone of Bavaria. If the solitary Solnhofen feather impression noted by von Meyer (*1*), which cannot be assigned with certainty to any taxon, is excluded, only three specimens were known prior to the present discovery: the London specimen initially reported by von Meyer (*2*) in 1861, the Berlin specimen discovered in 1877, and a

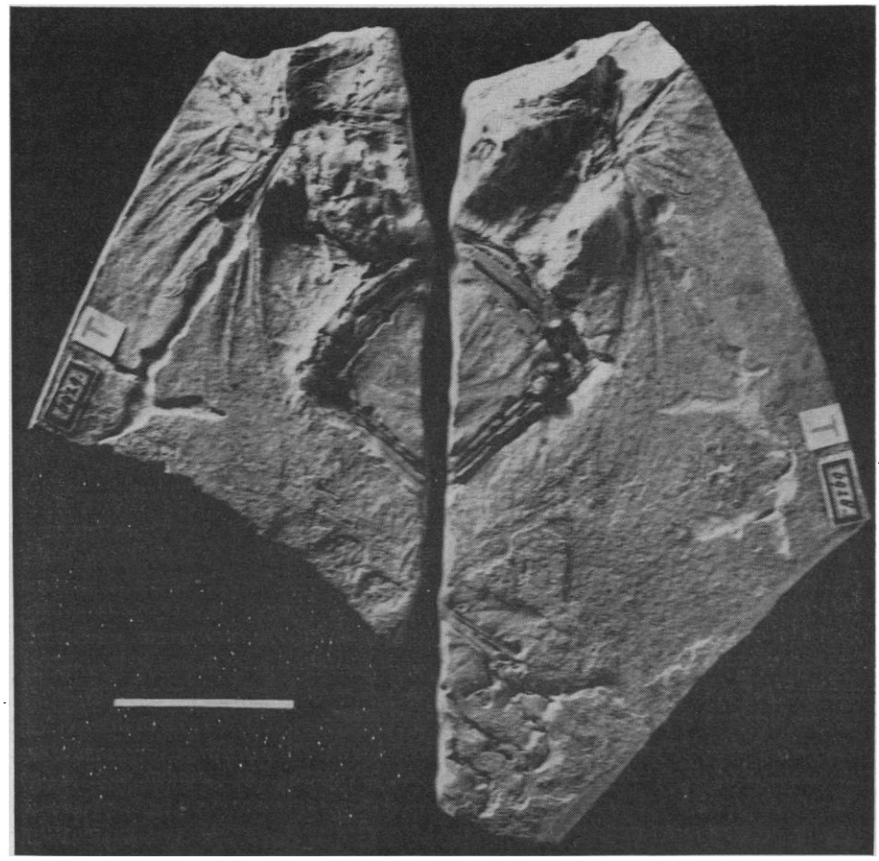

Fig. 1. Part and counterpart slabs that contain impressions and skeletal parts of *Archaeopteryx* cf. *lithographica*. Phalanges and claws of left manus and gastralia are on the left-hand slab. Fragments of both femora, pubes, tibiae, and fibulae show on the right-hand slab. Portions of the feet are at lower right. The scale is 5 cm long.

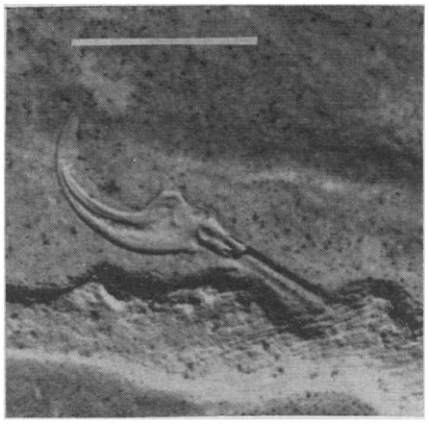

Fig. 2. Greatly enlarged photograph of the terminal phalanx and its horny sheath, digit 3, left manus. The scale is 10 mm long.

poorly preserved specimen recognized in 1956 and now displayed in Solnhofen. The extreme rarity, as well as the unusual evolutionary significance of *Archaeopteryx* specimens, makes the present discovery noteworthy.

The "new" specimen was found 8 September 1970 on display in the Teyler Museum, Haarlem, Netherlands. It consists of two small slabs (specimens 6928 and 6929), part and counterpart, which contain impressions or parts of the left manus and forearm, pelvis, both legs and feet, and some gastralia. Faint impressions of wing feathers are also preserved (see Fig. 1). The Teyler Museum records indicate that it was collected sometime prior to 1857, and its discovery thus predates all the other currently known *Archaeopteryx* specimens. No precise locality or stratigraphic data are known at present, except that the slabs were found near Riedenburg, which is about 25 miles (40 km) east of Eichstätt and 32 miles (52 km) east of Pappenheim, the sites at which the Berlin and London specimens were found.

The specimen was described by von Meyer (*3*) in 1857 as the type of a new pterosaur species (*Pterodactylus crassipes*) and later was figured by him (*4*) in his monograph on the fossil reptiles of the Solnhofen lithographic limestone. The few elements preserved are distinct from all known pterosaurian remains in the extreme discrepancy of finger lengths and in the fact that digit 2 appears to have been nearly twice as long as metacarpal 2. Although probably referable to the same species as the London and Berlin specimens [although not all authorities accept de Beer's (*5*) judgment that those two specimens belong to a single species], the present remains are much too fragmentary for positive species identification.

The Teyler specimen is very fragmentary and far less spectacular than the London and Berlin specimens, factors that undoubtedly contributed to its misidentification. Some elements of the manus are, however, extremely well preserved and provide important new evidence that is not preserved in any of the other specimens. In addition to the terminal phalanges of digits 1 and 3, the actual horny claws are also preserved apparently uncrushed. Preservation of the horny claws is apparently unique among Mesozoic fossil vertebrate remains. The significance of the unusual form of these horny claws (see Fig. 2) cannot be fully assessed until careful comparisons are made with the Berlin specimen (planned for 1971). It is clear, however, that these structures provide important new evidence that must be considered in any future evaluation of the two principal theories on the origin of bird flight—arboreal versus cursorial. My own initial and very tentative interpretation is that these structures do not appear suitable for arboreal habits.

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12 October 1970

Porifera: Sudden Sperm Release by Tropical Demospongiae

Abstract. *Three tropical marine demosponges inhabiting the deep coral reefs of Jamaica expel immense clouds of milky fluid from exhalant apertures. Analysis of samples shows this fluid to contain mature male gametes. The behavior is an individual or a population event in different species.*

Events of sexual reproduction in sponges have generally been inferred from histological studies of parental tissues (*1*). The presence and absence of gametes and larvae in successive samples indicate only the broad temporal boundaries of release of sexual products. The sudden release of huge clouds of spermatozoa from three species of tropical demosponges is reported here.

These three events occurred on the coral reefs bordering the north coast of Jamaica at Discovery Bay and were observed while scuba surveys of the reef fauna were being conducted. The dates and times of the observations were: *Verongia archeri* single individual, 3 p.m. 14 February 1969, 2 days before new moon; *Geodia* sp. single individual, 4 p.m. 2 July 1969, 3 days after full moon; *Neofibularia nolitangere* local population, 2:30 p.m. 23 October 1969, 2 days before full moon. There is only one previous report of a similar event (*2*).

A single specimen of *Verongia archeri* (Higgin) (Dictyoceratida), situated at a depth of 49 m on the deep fore-reef slope, emitted a column of "smoke" 3 m high for at least 10 minutes (Fig. 1). This was the only specimen of any species exhibiting this behavior in the surveyed area. Microscopic examination of the samples showed that the effluent contained immense numbers of mature spermatozoa (Fig. 2).

The second sponge, *Geodia* sp., belongs to an order (Choristida) in which evidence of sexual reproduction has rarely been reported (*3*). A single specimen, situated at 29 m on the upper edge of the deep fore-reef slope, released a diffuse turbid effluent for at least 20 minutes. Again, only this single individual was active in this process. Samples of the effluent again proved to contain mature spermatozoa (Fig. 3). Tissue samples of the sponge were taken the following day, fixed, desilicified in HF, and studied in section. Male gametes in ripe and developmental stages were still numerous throughout the deeper tissues.

The third sponge, *Neofibularia nolitangere* (Duch. and Mich.) (Poecilosclerida) (*4*), is a common species of the fore reef and fore-reef slope at depths from 10 to 30 m. Over an observation period of 30 minutes, approximately one-quarter of the surveyed colonies were emitting a diffuse cloud of material extending 2 to 3 m above the reef surface. Due to the toxic nature of the species, no attempt was made to collect