served, and these are similar to the characters noted in the second lower cheek tooth. The specimen resembles, but may be slightly smaller than, the comparable tooth of *Megalonyx jeffersonii*. Dimensions, in mm, of the Academy of Natural Science's No. 15208 are: transverse diam 25.9; anteroposterior diam 17.7.

Interest in the specimen arises largely from its occurrence so far north on the American continent. In 1942, Stock (*2*) reported the occurrence of a ground sloth at a locality 15 miles southwest of Fairbanks, Alaska. This identification was based on a phalanx, representing apparently a species of *Megalonyx*. The tooth from north of Great Slave Lake is the second occurrence of the ground sloth *Megalonyx* to be noted in the northwestern region of North America, but the locality is considerably east of Fairbanks, Alaska.

The Yellowknife specimen is undoubtedly of Pleistocene Age, although its exact position within the Pleistocene is uncertain. It is perhaps not surprising to find the genus ranging this far north during Pleistocene time, in view of its usual association with forest faunas. The Yellowknife and Fairbanks specimens are the only two records of a ground sloth north of the United States-Canadian boundary. These specimens may date from the warm phase of postglacial time, or they may be older and date from an interglacial stage. An interglacial age of some of the Quaternary mammals from Alaska has been suggested by Johnston (*1*).

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Infrared Spectrometry of Small Samples with the Reflecting Microscope

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It has been shown (*1*) that the usefulness of infrared spectrometry may be extended through the application of the Burch (*2*) reflecting microscope. As this microscope is a custom-built instrument available only at Oxford, we investigated the possibility of using American reflecting microscopes in connection with infrared spectrometry.

The Bausch and Lomb Optical Company's Grey design Type V apochromatic reflecting microscope condenser and objective of 0.72 NA (*3*) were placed at our disposal, through the courtesy of Mr. L. V. Foster of that company, for tests in the infrared region of the spectrum. From the standpoint of infrared spectrometry these units are not as useful as totally reflecting systems because of their limited frequency range (from the ultraviolet to 2500 cm^{-1}) imposed by the inclusion of refractive and infrared absorptive elements. It was possible, however, to obtain infrared spectra from the visible region to the carbon dioxide absorption near 2400 cm^{-1}, using samples of microscopic size.

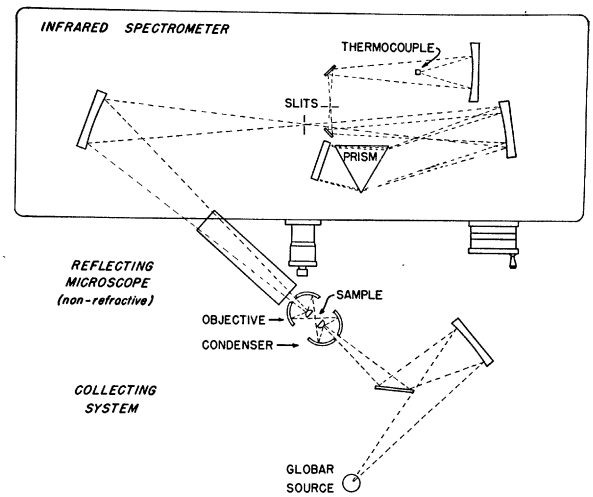

FIG. 1.

The promise shown by this study made it desirable to investigate the utility of the Bausch and Lomb Grey design, Type IV, 0.4 NA condenser and objectives (*3*). This design includes only reflecting elements. One model existed at the time of this investigation, and it was owned and operated by the Polaroid Corporation; its loan was made possible through the great courtesy of Dr. E. R. Blout of the Research Laboratories of that company and Prof. E. G. Rochow of Harvard, who kindly and carefully transported the microscope to and from Stamford.

It was not possible to introduce obvious optical refinements into the system because of the shortness of the time of trial, so the microscope was added to the optical system of a Perkin-Elmer model 12B infrared spectrometer, as shown in Fig. 1. An auxiliary Globar source collected the radiation and focused it into the reflecting condensing system. The focused radiation, after passage through the sample, was collected by the objective. The condenser and objective were mounted on a standard microscope which had been turned on its back. Any microscope equipped with a swinging stand for horizontal photography, or the Bausch and Lomb Type DDE, could be used (if the large reflecting optics would fit). The radiation emerging from the draw tube, without the use of an ocular system, was collected by the first spheroidal mirror of the spectrometer. This mirror then focused the enlarged image of the specimen onto the entrance slit. The physical dimensions were adjusted so that the diameter of this image was equal to the length of the slit.

The portion of the image of the specimen subtended by the entrance slit could be controlled by adjustment of the specimen on the mechanical stage of the microscope. The sample could be suspended in mineral oil on a rock salt plate or between plates, according to the customary infrared technique, placed in solution, or attached to a

[1] The author wishes to acknowledge the interest and help of Dr. T. G. Rochow and Mr. E. J. Thomas of the Microscopical Department of the Stamford Research Laboratories.

stretched fine wire by lightly greasing the wire with mineral oil. From the weight of a crystal suspended on the wire, the area of the specimen image on the slit,

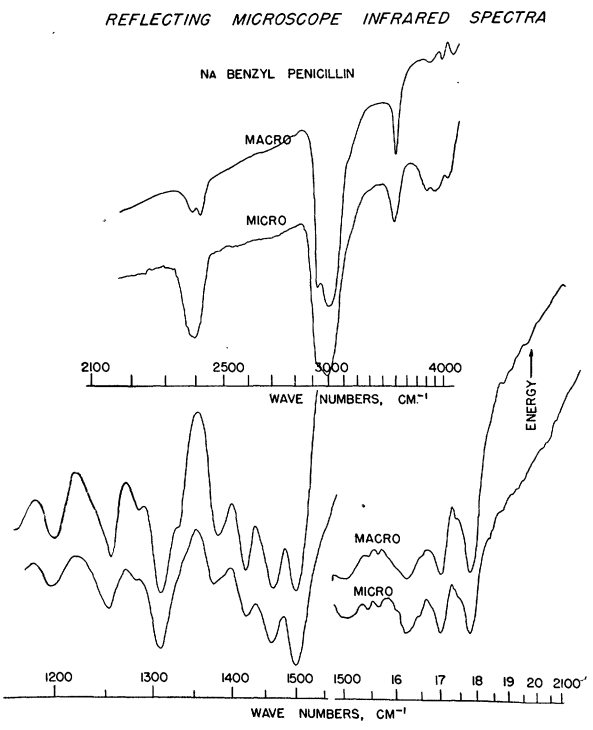

FIG. 2.

and the area of the slit it was possible to estimate the mass of the sample under observation. Inasmuch as the slit width must be increased as the wavelength is increased because of the black-body characteristics of the radiation source, the estimated mass of an observed sample varied from 0.3 μg at 4,000 cm^{-1} to 3 μg at 650 cm^{-1}.

A portion of the spectrometer recordings on macro and micro size samples of sodium benzyl penicillin are shown in Fig. 2. The effect on resolution of the wider-than-usual slit widths necessary with the microscope is observable near 2400 and 1325 cm^{-1}. The micro sample recording was made with an amplification of the thermocouple output such that 0.3 μv gave a full-scale deflection of the Brown recorder. More careful adjustment of the optical system should enable the use of smaller slit widths and less amplification.

It is obvious that the use of such totally reflecting microscope systems in connection with infrared spectrometers should permit large reductions in sample size with attendant increased applications in the biological and crystal structure fields.

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A Method for the Study of Blood Loss in Hookworm Infestation[1]

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Leichtenstern (*7*) pointed out in 1886 that the hookworm (*Ancylostoma duodenale*) was an avid consumer of blood. In 1909 Whipple (*9*) made the same observation in this species as well as in *Necator americanus.* In 1931 Wells (*8*) reported a series of observations involving *Ancylostoma caninum* while the parasites were attached to the intestinal mucosa of living dogs indicating, without a doubt, that this parasite was able to withdraw enough blood per day to account for the anemia often found associated with hookworm infestation. Work done by Cruz in Brazil, and by Rhoads and Castle and their associates in Puerto Rico has materially contributed to our knowledge of this parasitic disease. Wells (*8*) states that there is a possibility that a single worm may withdraw as much as 0.8 ml of blood in 24 hr but that there is apparently a considerable amount of variation in the activity of individual worms.

We present here a pair of preliminary studies of the average rate of blood loss in moderately infested dogs. These studies were carried out in order to determine the feasibility of the method of approach used, with the intention of extending it to a study of human hookworm infestation at a later date.

Two healthy adult mongrel dogs, 2-G and 1-J, were used in these studies. They had both been kept at an anemic level of blood hemoglobin for many months by frequent controlled hemorrhages and their reserve stores of iron were therefore depleted. At the time of application of the larvae the dogs' red cell hematocrits were 24% and 25%, respectively. About 2,000 infective larvae of *Ancylostoma caninum* suspended in saline were applied to each animal, contact being made between the toes and on the groin, where the body hair was sparse. The animals were fed a diet consisting of white bread, Klim, salmon, and cod liver oil in order to restrict iron intake (*6*), and were housed in cages with perforated metal floors. After a period of 5–6 weeks several examinations of feces showed numerous ova of the parasite. One of the dogs, 1-J, earlier had severe diarrhea, accompanied by the excretion of a moderate amount of mucus and red blood.

Four weeks following application of the larvae each animal received by vein 100 ml of blood from a donor dog. This latter animal had previously been fed large quantities of radioactive iron while anemic in order to build up red cells containing tagged iron in the hemoglobin iron (*5*). Immediately after, the diet was again allowed to consist of hospital table scraps so there was no exogenous deficiency of iron.

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