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MANHATTAN: "A TROPIC ISLE?" *

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I am sure you would agree that modern, high-speed, commercial jet aircraft have figuratively shrunken the globe. In recent years, relatively vast new areas of the earth have been scrutinized by students of the physical and natural sciences. Our colleagues, the virologists, report almost monthly new discoveries such as the Whataroa virus, a new arbovirus isolated in New Zealand, the chikungunya virus, Kyasanur Forest disease, and a host of other unpronounceable agents, diseases, and locations. Yet, we in tropical medicine are not making many really striking discoveries. It may be that parasitologists, having started several hundred years earlier and being more adventuresome, exhausted the field long before the jet era.

In preparation for this Presidential Address, I have studied maps and charts in the hope of discovering a little-known geographic location with a little-known parasite or disease about which I could speak with authority or from experience. My search was not fruitful, and I even considered a mythical site and nonexistent syndrome, but I could not hope to deceive my astute and learned friends for long. Finally, however, in my reflections on the subject of geographic disease, I did discover an island rich in tropical medicine and other lore about which I could speak from experience if not authority.

And this island will be the subject of my talk today.

My island has an area of but 31.2 square miles. It is located 40°N by 73°W. It was observed in 1524 by a Florentine navigator, Giovanni da Verrazano, and first settled in 1613 by Adriaen Block, a Dutch explorer.

The average annual temperature is 52.7°F, the highest monthly average being 74.4° in July and the lowest 31.5° in February. The annual precipitation is 42.87 inches. Further ecologic data relative to meteorologic conditions, flora, fauna, and population composition are perhaps best illustrated in Figures 1–29.

The flora. Most Temperate and many Subtropical and Tropical plants, shrubs, and trees may be found where appropriate growth conditions occur or can be simulated (Figs. 1 and 2).

The fauna are represented by many classes of animals, and I have selected some of the more interesting specimens found on our soil or in our waters (Figs. 3–11).

The weather. Rain and wind (Fig. 12) as well as snow (Figs. 13 and 14) may be severe and at times interfere with the usual pursuits of the inhabitants. In the summer, the temperature may remain in the 90° range for prolonged periods, and for means of relief each according to his opportunities (Figs. 15–17).

The population. Here we see a typical clean, quiet, residential street (Fig. 18) and next (Fig. 19) another typical unclean, usually crowded, and noisy residential area.

This charming resident (Fig. 20) is representative of the Far East, and comfort is in striking contrast to a less fortunate, indigenous native (Fig. 21). All continents are represented on our island. Africa (Fig. 22), our island natives (Fig. 23), India (Fig. 24), North Africa, and the Middle East in ritual holiday celebrations (Figs. 25 and 26), and finally Chasidic Polish Jews at an outdoor lecture (Fig. 27).

There are less cultural activities, but the spirit of camaraderie is shown in Figures 28 and 29: one notes the sharing of this spirit.

I wish at this point to thank you for your indulgence in this byplay on Manhattan Island and to proceed in a more serious vein with a discussion of "Personal experiences with selected relatively uncommon aspects of parasitism in New York City."

If one refers to the Tables of Contents of tropical-medicine texts, one is impressed by the broad representation of the diseases and infections that have occurred in New York in the past 25 years or more or during the period of my interest and exposure to them. One could cite smallpox,

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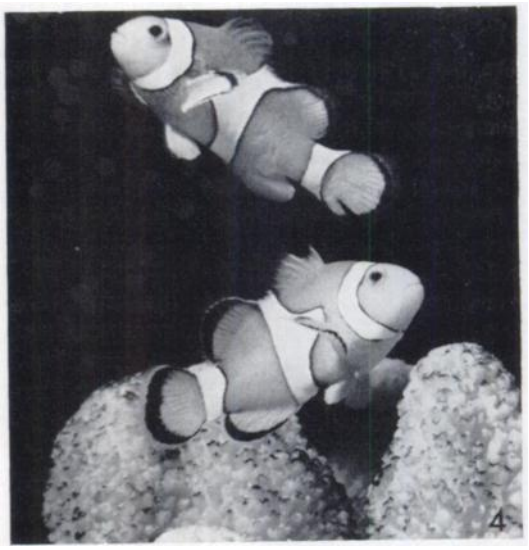
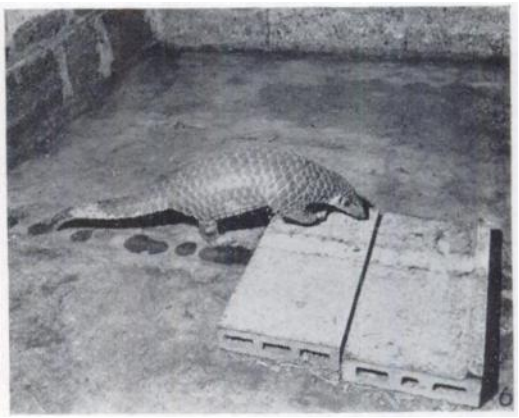
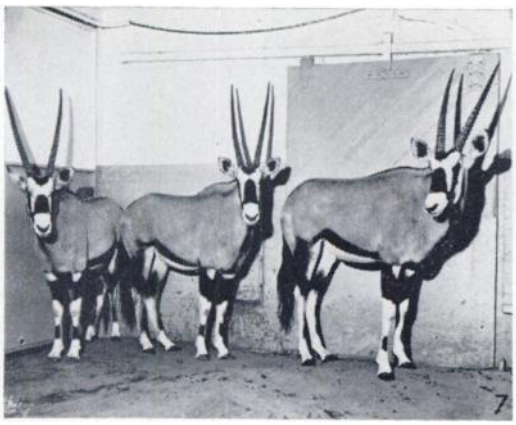
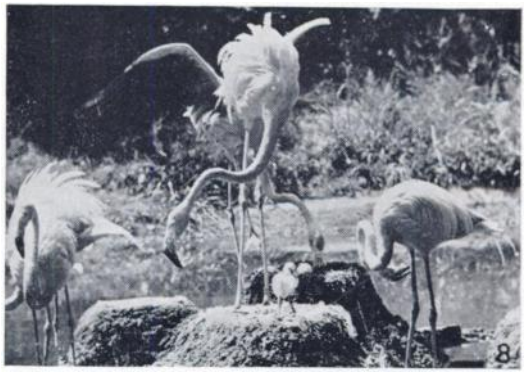




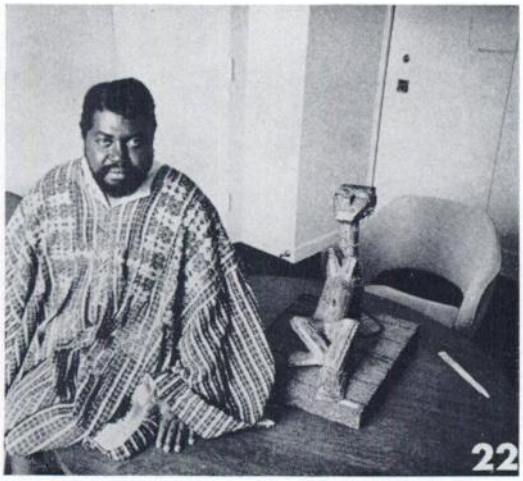
FIGURES 1–6. Fauna and flora, Manhattan Botanical Gardens, Zoo, and Aquarium. (Photographs courtesy of *The New York Times*.)



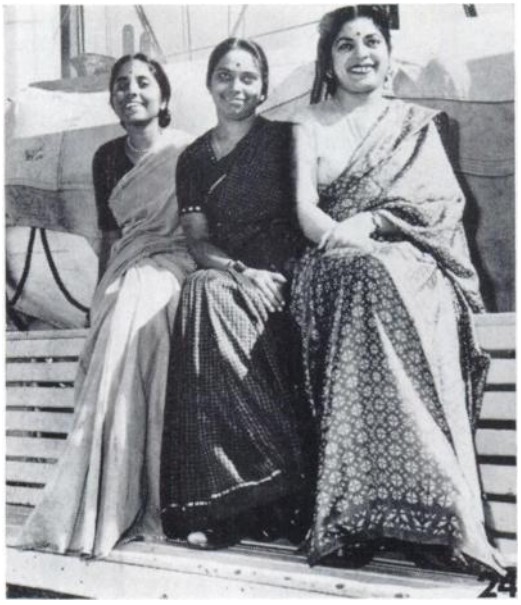


FIGURES 7–11. Fauna and flora, Manhattan Botanical Gardens, Zoo, and Aquarium. (Photographs courtesy of *The New York Times*.)

FIGURES 12–17. Climatic conditions. (Photographs courtesy of *The New York Times*.)



FIGURES 18–23. Living conditions and inhabitants. (Photographs courtesy of *The New York Times*.)



FIGURES 24–29. Living conditions and inhabitants. (Photographs courtesy of *The New York Times*.)

leprosy, the dysenteries, several types of typhus, and spirochetal and fungal diseases; but to refer to them even casually would be too burdensome and time-consuming. I shall limit my discussion primarily to the presentation of brief anecdotes relative to a few of the protozoa and helminths.

MALARIA

You will all recognize this *Anopheles*, natural vector of malaria (Fig. 30). I collected a number of these mosquitoes in Central Park and on the South Shore of Long Island in the mid 1930's, though no malaria in the area attributed to natural transmission had been recorded for a great many years. However, another vector (Fig. 31) was a very effective instrument, which resulted in an epidemic of more than a thousand cases of severe falciparum malaria and several hundred deaths during a period of about 5 years. The epidemic was a result of a new vogue in drug addiction—namely "main line" or intravenous shooting, the sharing of the injection apparatus, and the accidental introduction of malaria into the addicted population. In Figures 32, 33, 34, and 35, one notes the scarred appearance of a drug addict's vein, his peripheral blood smears, and finally, a smear of his brain in which a capillary full of parasites is evident. The gametocytes in Figure 36 were found in smears made from asymptomatic drug-addicted prisoners who denied having had malaria. However, the serious consequences of malaria was now common knowledge amongst drug addicts, and many were taking quinine for any illness. Unfortunately others, not addicts, have also died periodically in New York of falciparum malaria mainly because of delay or

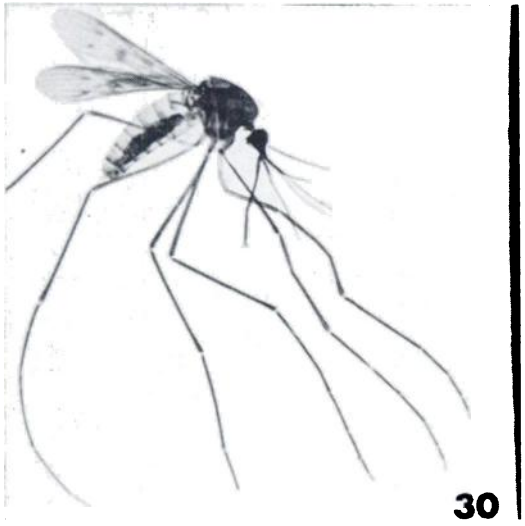


FIGURE 30. *Anopheles quadrimaculatus* caught in Central Park.

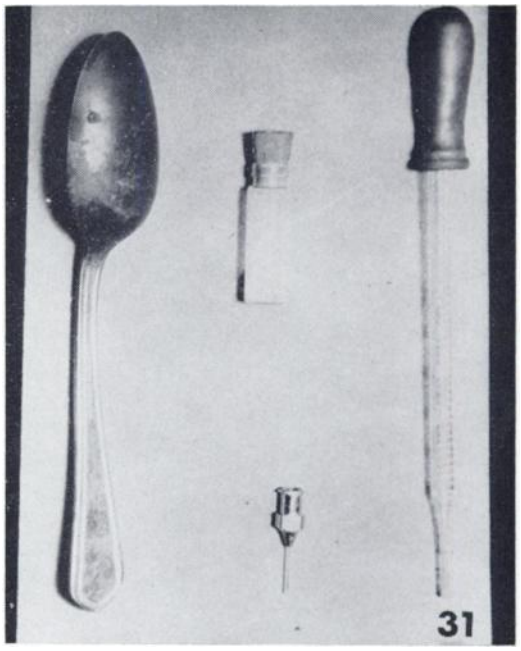
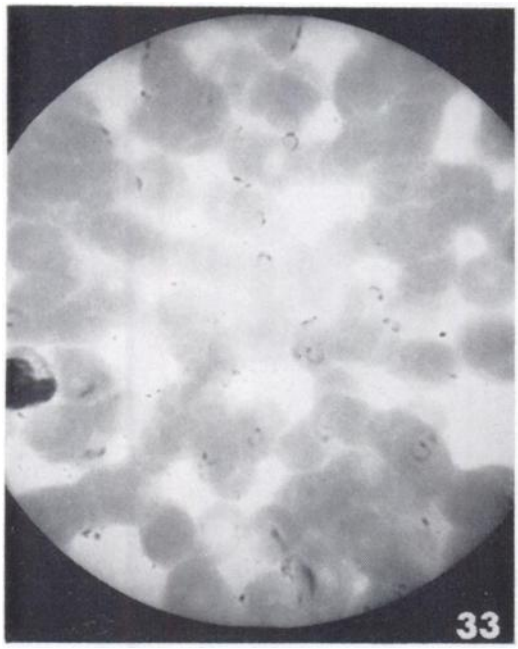
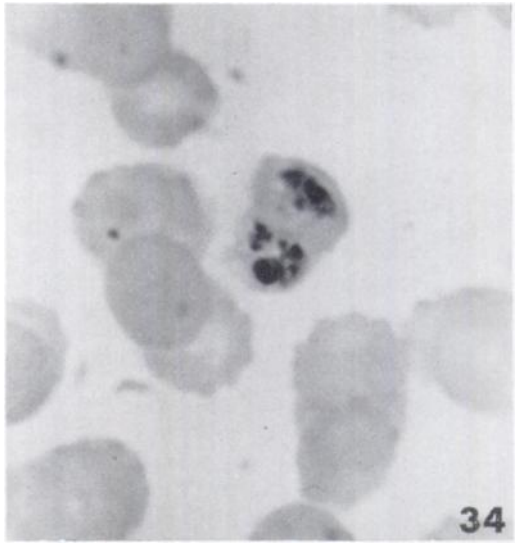
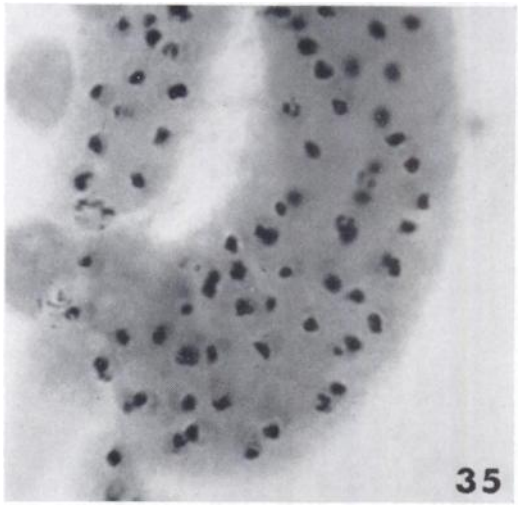


FIGURE 31. Apparatus for self-administration of heroin intravenously by drug addicts.

FIGURE 32. Arm of drug addict; note thrombotic vein.







FIGURES 33–35. Blood and brain films from drug addicts with *P. falciparum* malaria

failure to consider malaria in the differential diagnosis. Figure 37 is an example of such an instance. The patient, an airline pilot, had recently been in Africa. After a few days of illness and medical care in a New York suburb, he became deeply jaundiced and disoriented and when admitted to a New York hospital with a tentative diagnosis of yellow fever, he was vomiting, semiconscious, and had a high fever. He died 4 hours after this smear was made (Fig. 37). The brain smears were the same as the one I showed from a drug addict (Fig. 35). In recent years, such tragedies are becoming rare.

I am reluctant to leave the subject of malaria, but in passing, I must refer to other interesting and at times temporarily baffling manifestations of malaria such as the transfusion of quartan infection by a donor continuously in residence in

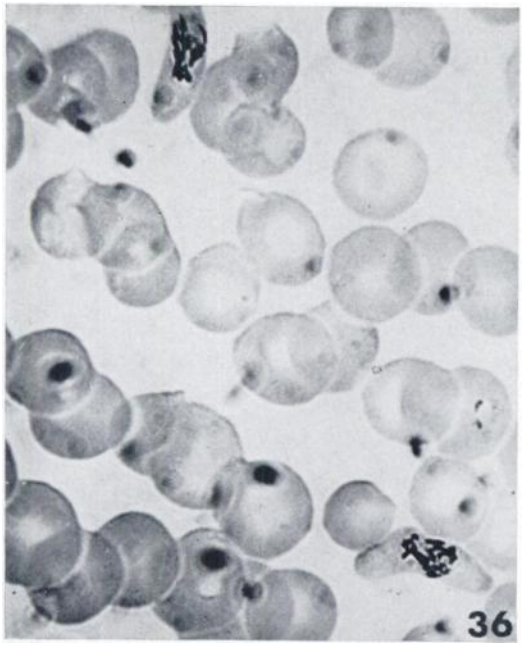


FIGURE 36. Blood film from drug addict with *P. falciparum* malaria.

New York for more than 20 years; the delay of almost 4 years after chemosuppression to the development of a primary attack of ovale malaria; and the occurrence of a vivax relapse in a missionary following a fracture of the femur 7 years after leaving the endemic area.

AMEBIASIS

Of many unusual manifestations of amebiasis, I believe the incident I shall relate is unique in

	F_1		F_2
9/66	Gl		
10/66	Eh, Ec, En, Df		Eh, Ec, En
11/66	NEG		NEG
12/66			Gl, En
7/67	Gl, En		
	R_1		R_2
10/66	Eh, Ec		Eh, Ec
12/66	NEG		NEG

FIGURE 38. Epidemiology of amebiasis in homosexual men.

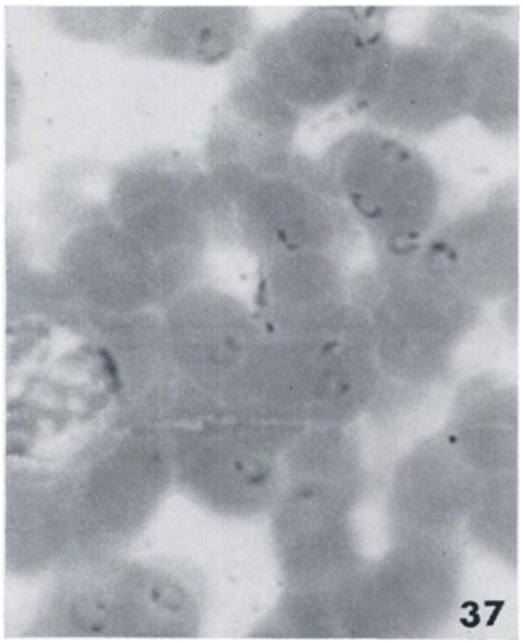


FIGURE 37. Blood film from a case of fatal *P. falciparum* malaria in an airline pilot.

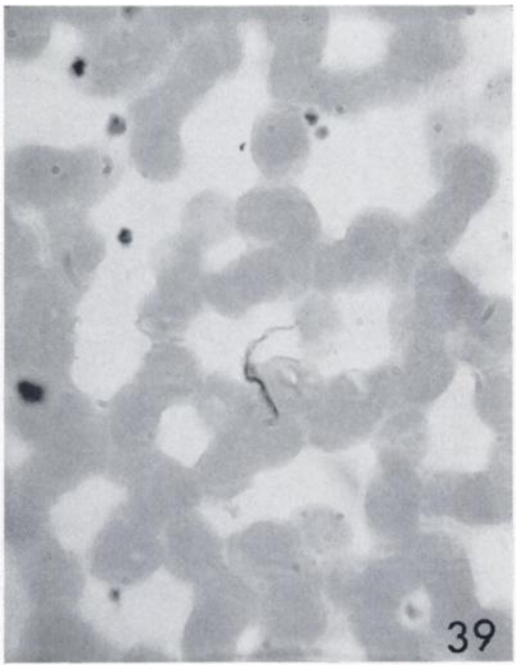
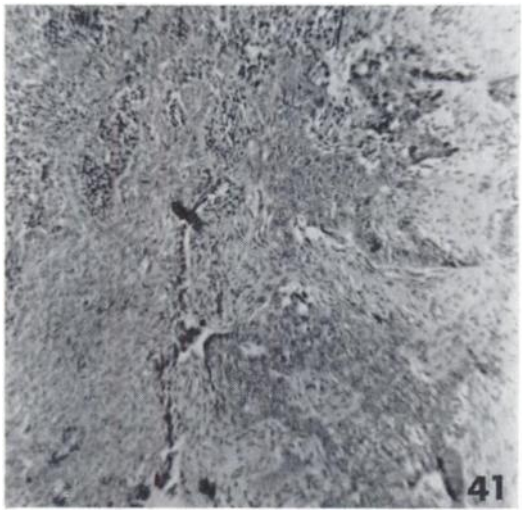


FIGURE 39. Trypanosome in peripheral blood of a patient infected during an African safari.



FIGURES 40 and 41. Basal-cell carcinoma diagnosed and treated as leishmaniasis.

the epidemiology of this infection (Fig. 38). The story began simply with a request from a physician for information on the treatment of giardiasis. A month later, he stated that his patient (F_1, Fig. 38) now had numerous other intestinal parasites. In taking the history I noted that the patient had not been out of New York, that he had had infectious hepatitis and secondary syphilis, and in response to a direct question, he admitted to homosexual practices. Further discussion revealed that in the interval between the treatment for giardiasis and the second stool examination, his roommate, Mr. F_2, had been to India and returned suffering from diarrhea. The results of the examination of F_2 and others of F_1 and F_2's acquaintances disclosed amebic infections in R_1 and R_2 who were roommates in another part of town but who shared experiences with F_1 and F_2. At this point my sleuthing lost contact, but I later learned of additional subjects involved in this epidemic.

TRYPANOSOMIASIS

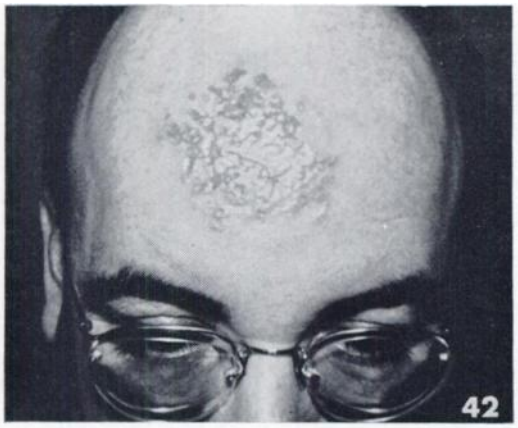
One would hardly expect to see a patient with active African trypanosomiasis in New York, but a patient and her husband, residents of Westchester County, had been on a safari in Rhodesia and Bechuanaland and spent a total of about 10 days in several areas where trypanosomiasis was endemic. A few weeks later while in South Africa, the woman had headache, fever, and an ulcer on one leg. A physician in Johannesburg prescribed an anti-malarial without benefit. A second physician sent a technician to collect blood films and later reported the presence of a few trypanosomes.

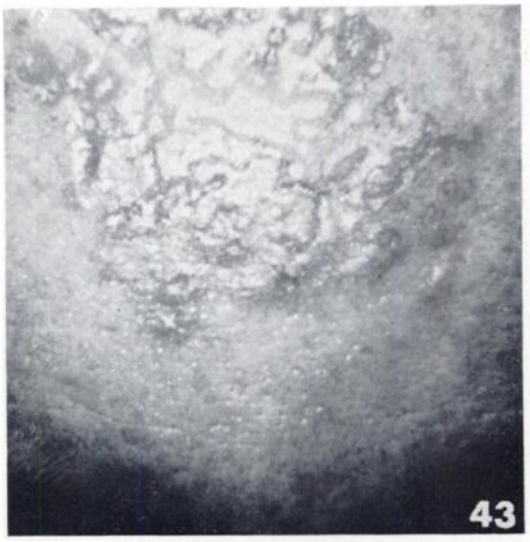
The patient and her husband returned to New York bringing with them a box of ampules of Suramin and a letter referring the husband to me for a "check-up" and the patient to her physician in Westchester for the injections. When the doctor found he couldn't dissolve the drug he suggested the patient accompany her husband during his consultation.

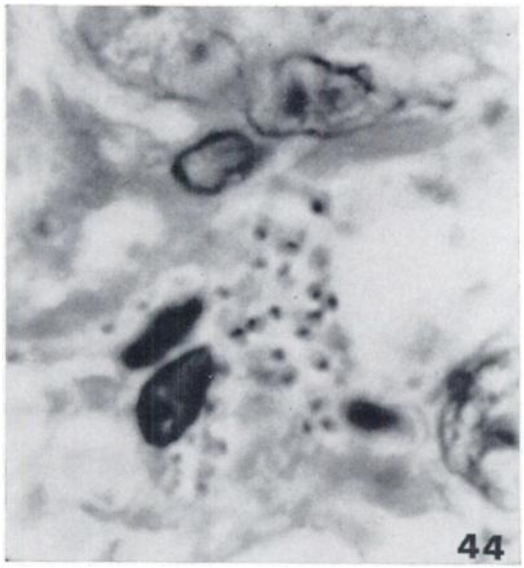
I was skeptical since I had never heard reported in this country trypanosomiasis acquired following a short safari, and I personally knew of many expeditions, explorers, scientists, etc., who had been in highly endemic areas without ensuing trouble. In view of the toxicity of the drug and possible psychological and medico-legal problems that might follow treatment of an uncorroborated diagnosis it was suggested that therapy be deferred until the original slide could be obtained and re-examined. It soon came, and to my amazement there were trypanosomes (Fig. 39). The patient completed her treatment in Westchester, the husband having lost confidence in the skepticism of the so-called expert.

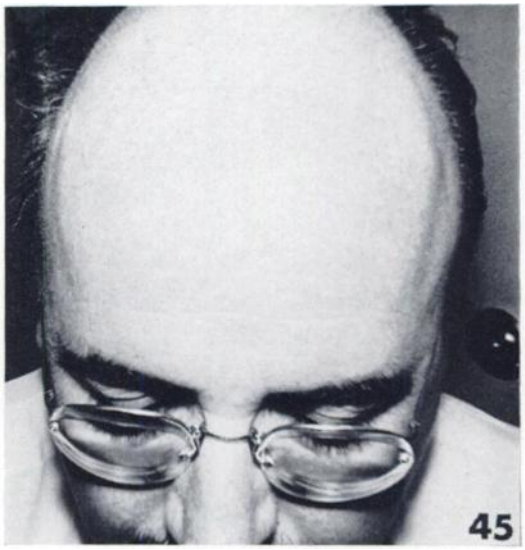
LEISHMANIASIS

Oriental sores are not rarities in New York, but occasionally there are difficulties in diagnosis or







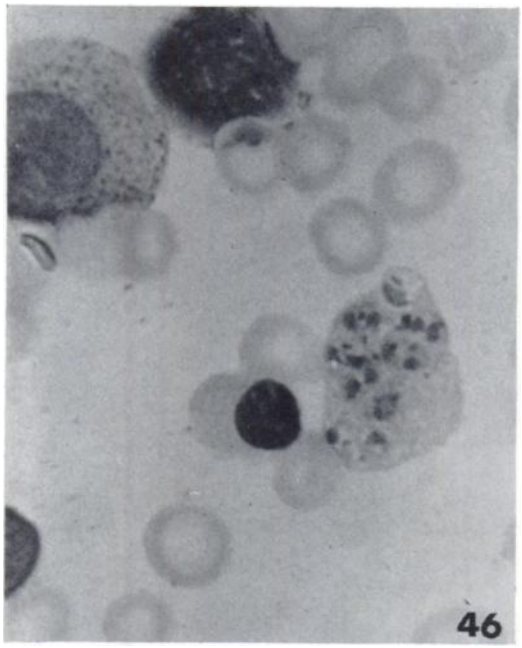


FIGURES 42-45. Cutaneous leishmaniasis suspected as malignancy. **42** and **43.** Lesion before treatment. **44.** Tissue taken at biopsy, photomicrograph. **45.** After treatment.

unexpected sequelae. I shall briefly cite two such instances.

In the first case, the patient, a 46-year-old woman who had lived in Colombia and Peru for 40 years had an ulcer on the face that without treatment healed after several months. It later opened again and was diagnosed clinically as cutaneous leishmaniasis in Venezuela on the basis of its appearance, exposure in an endemic area, and a positive skin test although at no time were *Leishmania* found. For the next 2 years, the lesion was periodically active, and finally in New York when smears and cultures were negative, a biopsy revealed the nature of the lesion (Figs. 40 and 41). One can't be sure that the second disease did not follow on the heels of leishmaniasis, but its course suggests a basal-cell carcinoma from the beginning.

The second case is of a lesion on the scalp (Figs. 42 and 43) in a teacher who had been to India for several months, a year previously. In this case, a biopsy in Ohio was reported first as nonspecific inflammation and later, as the lesion progressed,



FIGURES 46–47. Bone-marrow smear and culture from a Greek child with kala-azar.

as suspicious for malignancy. It was finally correctly diagnosed in Massachusetts. But of interest is the fact that the original slides, sent from Ohio when the patient came to New York for treatment, were diagnostic when re-examined (Fig. 44). Figure 45 shows healing after treatment.

VISCERAL LEISHMANIASIS

Kala-azar manifests itself in New York only rarely. I recall one instance in which the patient came to New York from an endemic area with a clinical diagnosis of kala-azar not confirmed by laboratory examinations abroad. Her illness was characterized by fever, leukopenia, and enlargement of the liver and spleen. There had been only a temporary response to antimony, and she came here for further treatment. In New York, spleen and bone-marrow smears, cultures, and hamster inoculations were negative. There was no response to antimony, and at autopsy the disease process was found to have been visceral tuberculosis.

Two proved cases however come to mind, one in a child from Greece with fever, anemia, leukopenia, and splenomegaly. The bone marrow (Fig. 46) obtained to exclude leukemia or other hematologic disease was diagnostic as was the culture (Fig. 47).

The other patient, a captain of a French cargo vessel, became violently ill while in New York, and during the early phase of his hospitalization he was treated for malaria on the basis of a past history, but without effect. He continued to have daily chills and fever, and severe anemia, leukopenia, and a rapidly enlarging spleen developed; a puncture was diagnostic (Fig. 48). Treatment in both cases was curative.

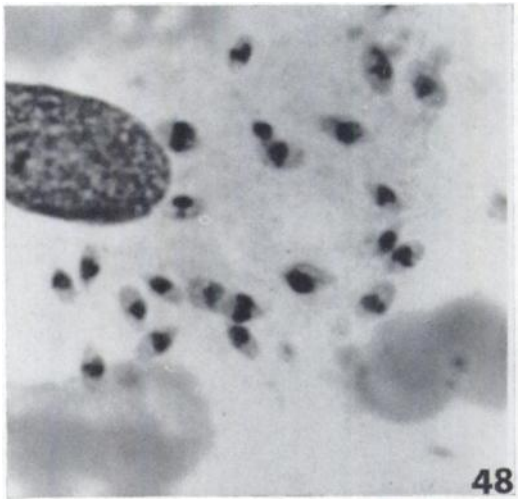


FIGURE 48. Spleen smear from a sea captain with kala-azar.

THE WORMS

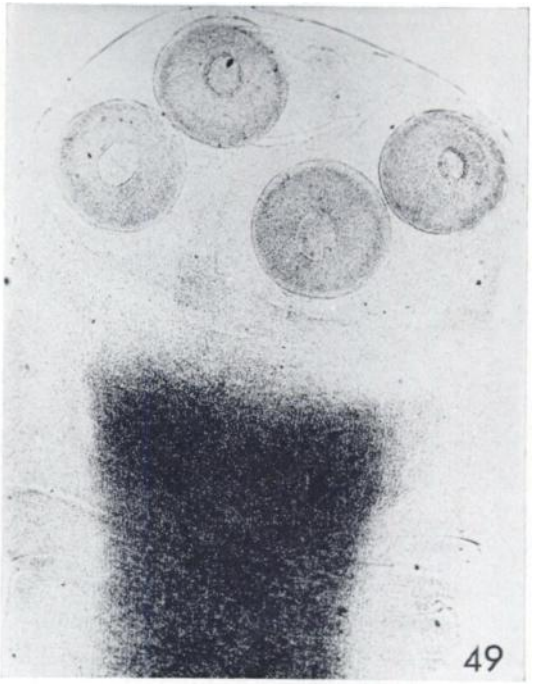
There are too many worms to permit, in a limited time, reference to very many. I have tried to select only a few interesting or unique experiences.

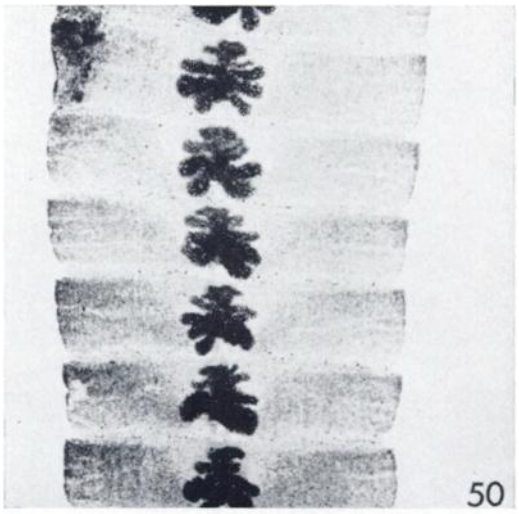
The tapeworms, *Taenia saginata* and *Diphyllobothrium latum*, are seen relatively often in New York but rarely together in the same individual or family.

A young dentist was passing tapeworm segments, which were referred by his physician for identification together with a request for an outline of the treatment. The segments were *T. saginata*, and intraduodenal therapy with quinacrine was advised with the understanding that the post-treatment specimens would be submitted to our laboratory. The following day, two jars arrived; the first containing a scolex of *T. saginata* (Fig. 49) and the second, several yards of *D. latum* (Fig. 50). Inquiry disclosed that the patient's sister, on learning that her brother was to be treated for a tapeworm, informed him she had one also and accompanied him to the hospital for the same treatment. They occupied adjoining rooms, and the results were as I've shown them. He was fond of steak tartare, and she was being instructed in the preparation of "gefilte fish." I am sure many of you know that this delectable dish is made by chopping a mixture of fresh fish, onions, bread crumbs, egg, and spices and is often tasted raw to insure proper seasoning.

Tapeworm segments in the lumen of the appendix as a cause of disease are not uncommon in some parts of the world, but are a pathological curiosity here, and I thought I'd show such a section (Fig. 51).

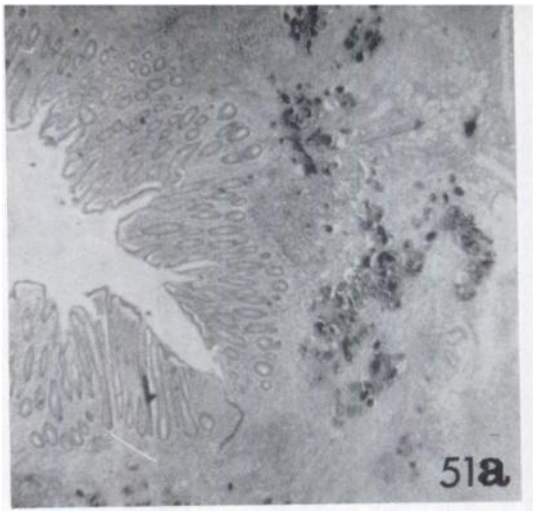
At this point I should like to digress a moment. Some of you I am sure are collectors—coins, stamps, butterflies, etc. I would like to suggest organ parasitology. For many years I have collected and studied the pathology of parasites of the nervous system, but to review these findings would be too time-consuming and possibly of little interest except to neuropathologists. I offer you a beginner's kit—the appendix—as an example of such a collection possible in a cosmopolitan area. Figures 51a to 51e are sections of appendices containing or affected by *S. japonicum*, *Ascaris*, *Enterobius*, *Trichuris*, and *Balantidium*, and Figures 51f and 51g, *Entamoeba histolytica*.

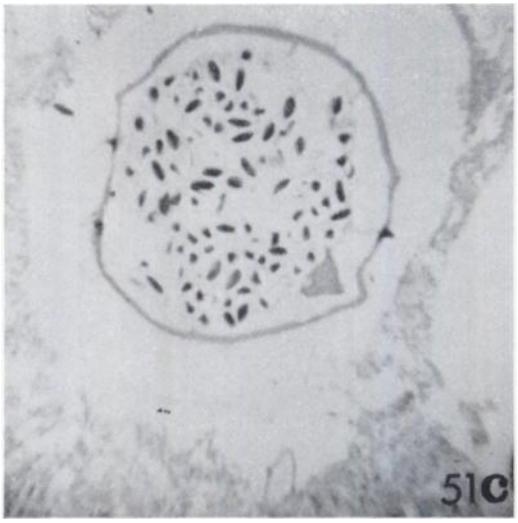


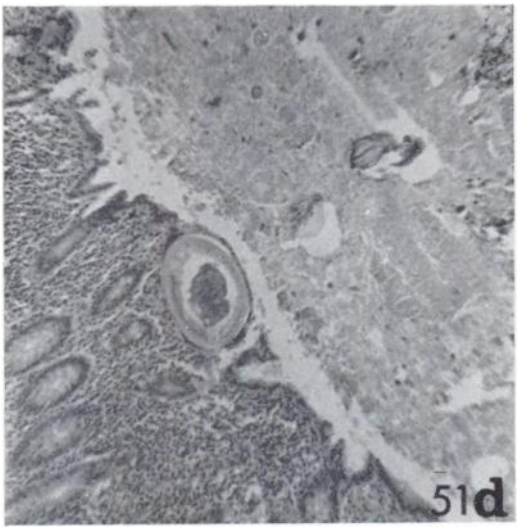


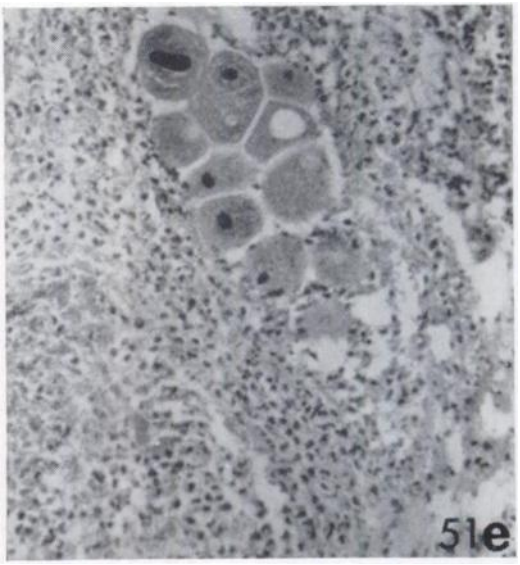
FIGURES 49 and 50. *T. saginata* and *D. latum* from brother and sister simultaneously treated.

Now to return to the tapeworms. Cysticercosis, in man, on the other hand, is very interesting when it is discovered in New York not only because it turns up unexpectedly in a bizarre location as for example in a cyst of the lip in a patient attending our dental clinic (Fig. 52) and in a cyst





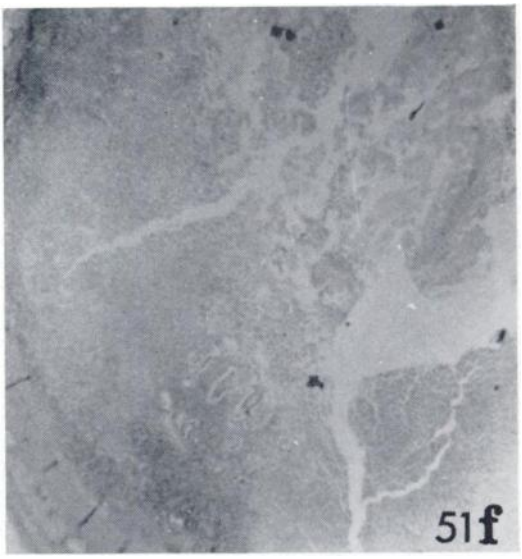


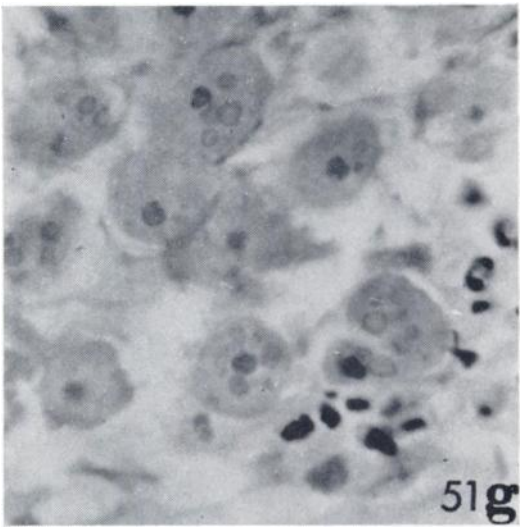


FIGURES 51 and 51a–51e. Sections of appendix: *T. saginata*, *S. japonicum*, *Ascaris*, *Enterobius*, *Trichuris*, and *Balantidium*.

removed from the chest wall of a Chinese patient (Fig. 53), but also because of potential or actual serious involvement of the central nervous system (Fig. 54).

This material, which came from the Medical Examiners Office, was obtained at the autopsy of an elderly Italian woman who collapsed and died on a street in New York, and was presented at a staff conference. The following week a resident on the chest service of Bellevue who had attended that conference and heard the discussion including the radiological aspects of the disease noted a few suspicious shadows in muscle tissue of an arm that was included in the chest roentgenogram of a ward patient. Additional roentgenograms (Fig. 55) of the torso and extremities were obtained and confirmed the tentative diagnosis of cysticercosis. The patient was a Negro, born and raised in Georgia, and never a resident in any area other than Georgia and New York. A further ramification in the coincidental relation of the brain and Georgia cases is of interest. I had come back from the DTM&H course in London in 1936 and began to collect material for a class collection in the Department of Clinical Pathology, where I was to teach applied parasitology. I thought of cysticercosis only because of the number of papers and monographs that were then appearing in the British journals. I inquired here and there but found no material in the extensive collections of our Department of Pathology nor in the museums of the Medical Examiner, or Bellevue. But within a month Dr. Milton Helpern, now the chief Medical Examiner, called to say he had just performed an autopsy in the first recorded case in New York. The specimen I showed is from that case. From it, class sets were made for Cornell as well as New York University. The occurrence of the two cases in so short a time is remarkable if one considers that the Medical Examiner performs 7,500 autopsies a year and that there are 46,000 admissions to Bellevue a year.

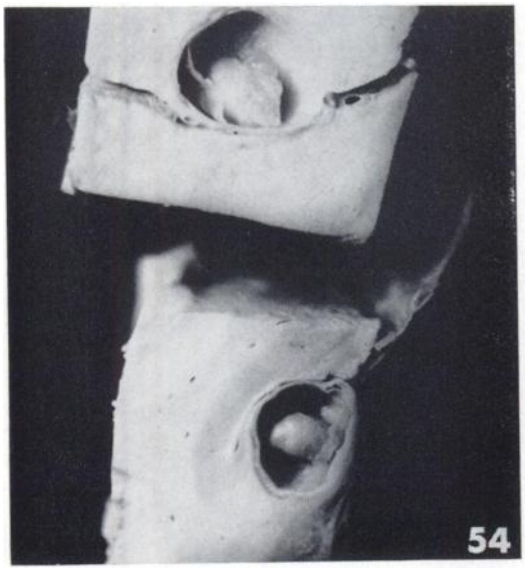


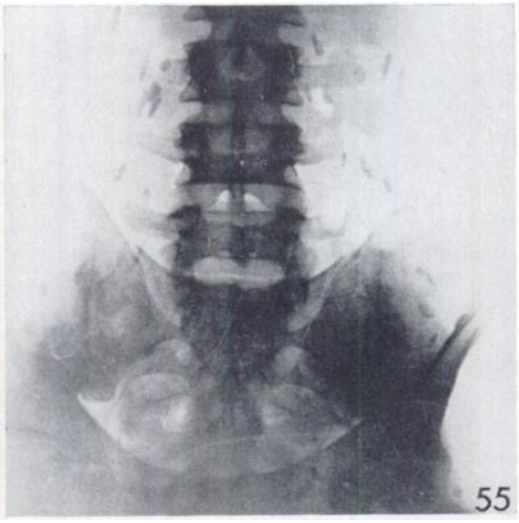


FIGURES 51f and g. *Entamoeba histolytica* from an appendix.

THE NEMATODES

Ascaris can provide the most inconceivable occurrences. I even recall seeing an old print showing the emergence of a small worm from the nipple of a female breast. My brief anecdote is better documented. A child with an abnormal chest roentgenogram (Fig. 56) was on the pediatric chest service being observed for suspected tuberculosis. However, the tuberculin test and gastric washings were negative. The patient had fever and eosinophilia of between 20 and 30%. Numerous stool examinations and a duodenal aspiration were negative for helminth ova or larvae. As a last resort hexylresorcinol was given in the hope of flushing out a worm that was not producing eggs or larvae. The result: Figure 57. The lung cleared, the fever and eosinophilia subsided, and continued observation and retreatment provided no explanation for the disease

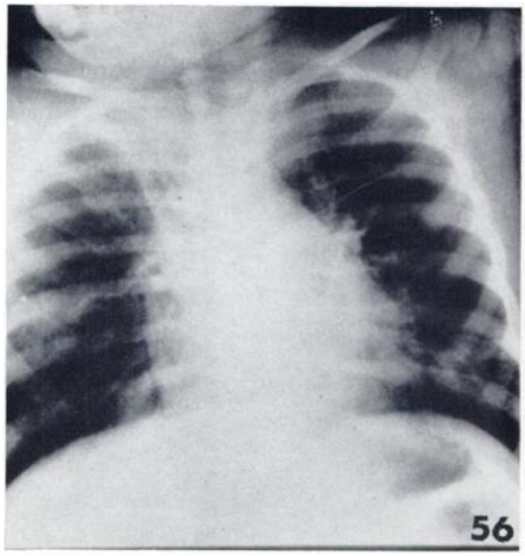


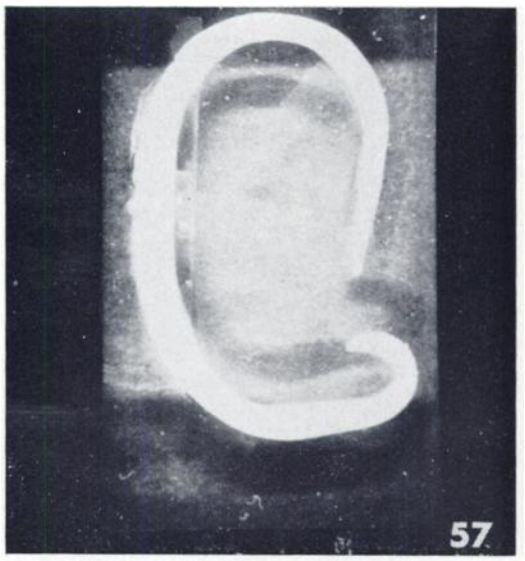


FIGURES 52-55. Cysticercosis: muscle, brain, and roentgenogram of torso.

other than the single male *Ascaris* worm infection, one form of Löffler's allergic pneumonitis. We have seen this in Puerto Rican children passing *Ascaris* eggs and in others who have never been out of the city.

It gives one a feeling of satisfaction in the study of a lesion of unknown etiology to be able to round out the study to the point of complete understanding. In the routine repair of an inguinal hernia a stringy bit of tissue was noted along the spermatic cord, and when sectioned (Fig. 58) showed the giant cell you see. The specimen was then serially sectioned and (Fig. 59) an adult filaria worm was noted. Blood smears made at night (Fig. 60) rounded out the picture. The patient was a native of St. Croix.





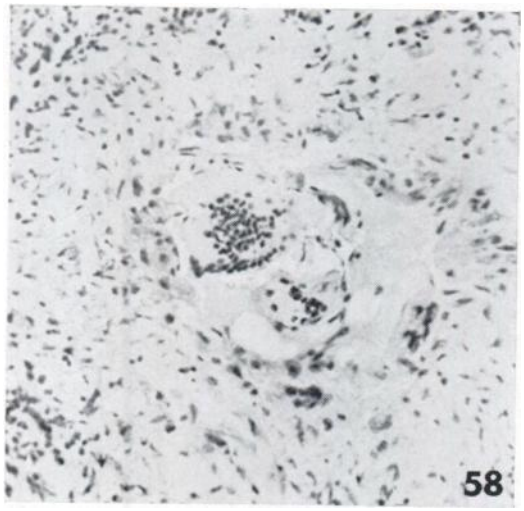
FIGURES 56 and 57. Löffler's syndrome: chest roentgenogram and worm recovered after treatment.

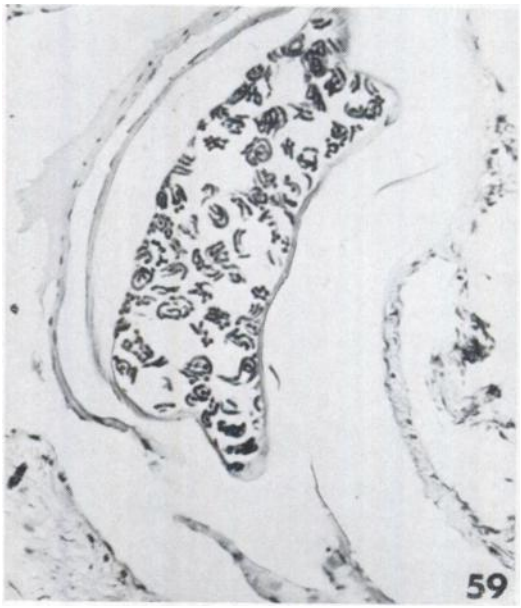
AND FINALLY . . . THE TREMATODES

Three species of *Schistosoma* are seen in New York: *S. japonicum* in veterans of World War II and occasionally in Chinese patients, *S. mansoni* primarily in Puerto Rican inhabitants of New York, and it as well as *S. haematobium* in natives of endemic areas from abroad or American students, scientists, explorers, missionaries, Peace Corps workers, and others engaged in various occupations who are exposed to infection in those areas and come to New York to live, work, study, or to obtain medical care. We have published detailed accounts of *S. japonicum* infections in Americans, and recently *The New Yorker* magazine has embellished our story of schistosomiasis in tourists. I shall give a few brief anecdotes relating to *S. mansoni* and *S. haematobium*.

The first case was a teen-aged Middle Eastern girl brought to New York as a domestic employee of a U.N. staff member. She was to be a baby-sitter when his pregnant wife had her baby. She was referred to one of us by the employer because "she seemed always to be menstruating and it never stopped." The first examination disclosed the bleeding to be urinary in origin and caused by *S. haematobium* infection, eggs being present in the urine and in the bladder (Fig. 61). Stool examinations and a rectal biopsy (Figs. 62–64) brought out the existence of other parasites. Yet except for the urinary bleeding, she appeared healthy. However, during the next several months of treatment directed at the elimination of the significant parasites, not only did her urinary bleeding disappear, but so did her menses! Being a patron of the maxim *Honi soit qui mal y pense*, I attributed the marked gain in weight to our abundant and nutritious food and the absence of menses to antimony. The gradually enlarging abdomen and the positive A-Z test revealed another much more common intra-abdominal parasite that I had not counted on.

With a name like Chang who was a patient at





FIGURES 58–60. Filariasis: giant cell, adult worm, and microfilaria

Bellevue Hospital, one was not unduly surprised when a liver biopsy was reported with a diagnosis of schistosomiasis. One naturally assumed it to be *S. japonicum*. When, however, the sections were reviewed prior to a staff conference, the few eggs found (Fig. 65) resembled *S. mansoni*. This was confirmed in stool and rectal biopsy (Fig. 66). As an added bonus, *Clonorchis* was also found. The patient was indeed a native of China, but as a seaman he had made numerous trips to Brazil where he enjoyed at times lengthy shore leaves. *Unde venis?*—the slogan of Professor Maegraith —"where have you been?" is emphasized in that case.

Apropos of the *Clonorchis*, I would like to illustrate another trite expression, namely "the treatment was worse than the disease." This section (Fig. 67) is from a medical-examiner's autopsy of a Chinese girl who was hospitalized and died after energetic treatment with injections of emetine for an asymptomatic *Clonorchis* infection. The tragic lesson here can also be applied to the use of toxic agents for the treatment of relatively innocuous parasitic infections.

The longevity of schistosomes in man is well known and may run to several decades. I wish now to put in for the record.

Mr. L., aged 59 years, was an electrician in New York. He fell off a ladder and fractured his skull in 1962. During a long period of convalescence and rehabilitation in a nursing home, gross hematuria developed in 1963. It was assumed he had prostatic or bladder stones, and he was returned to Bellevue for study and treatment. Cystoscopic examination and biopsy of the bladder (Fig. 68) established the diagnosis of old schistosomiasis. Calcified eggs were found in the tissues, but many urinalyses were at first negative. However, subsequent to another cystoscopic

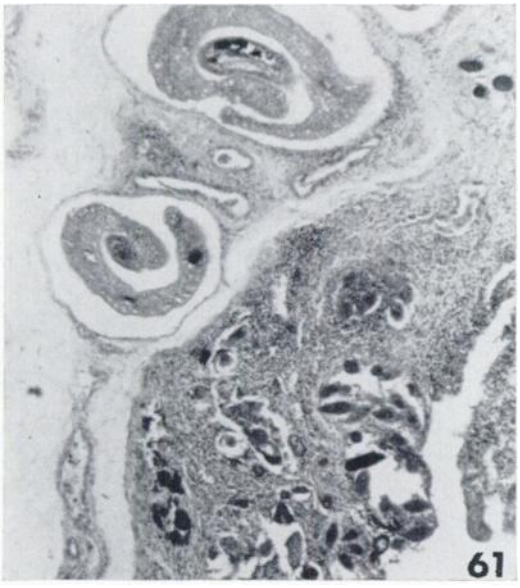
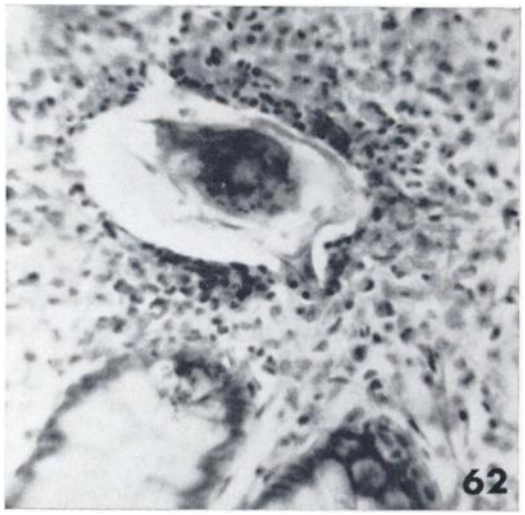
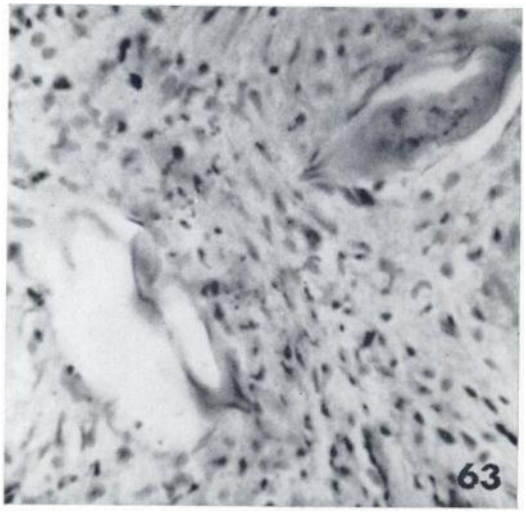


FIGURE 61. *S. haematobium* in section of bladder taken at biopsy.





FIGURES 62 and 63. Rectal biopsy: both *S. haematobium* and *S. mansoni*.

PROTOZOA
EH, Ec, En, Ib, Gl

HELMINTHS
Sm, Sh, Hw, A, Ts, Tt

RBC 4.8 Hb 11.3 WBC 12.5

CEPH FLOCC 2+, 3+

FIGURE 64. Other parasites

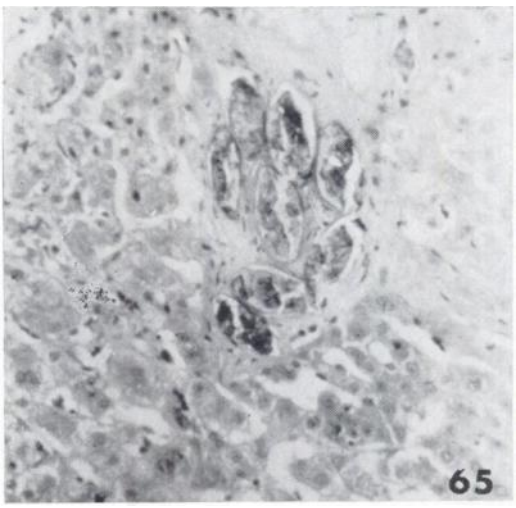


FIGURE 65. Schistosome eggs found in liver section taken at biopsy in a Chinese patient.

examination and prostatic biopsy much later, viable eggs were found in the tissues and urine (Fig. 69). Inquiry disclosed that he had worked for 1 month in Egypt in 1922. He then had lived in Palestine, Greece, and Yugoslavia until 1926 and in Austria until 1930. From then on he lived without interruption in New York City. Thus the interval between infection (1922–6) and the episode of bleeding (1963) represents a longevity for the worms of at least 37 years.

As an addendum to old schistosomiasis, I want to show one slide of *S. haematobium* found on removal of a kidney at Bellevue (Fig. 70). The lesion is a carcinoma, and in the section are calcified eggs. No implications of cause and effect are made.

I cannot completely ignore the arthropods, for I have a most interesting brief case report. The patient had been on a trip in the tropics. He returned with an ulcer on the penis, which was considered a syphilitic chancre. The Wassermann test was weakly positive. When massive doses of penicillin caused no improvement he was seen in consultation. As he leaned over to support his stance, he rested his hand on a table during the examination. It was noted that he had lesions on the hand resembling scabies. Biopsy of the hand lesion and the chancre on the penis (Fig. 71) showed both due to scabies.

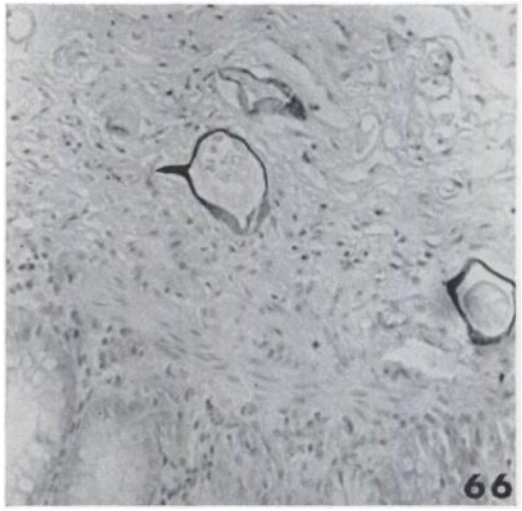


FIGURE 66. *S. mansoni* found in rectal tissue taken at biopsy from a Chinese patient.

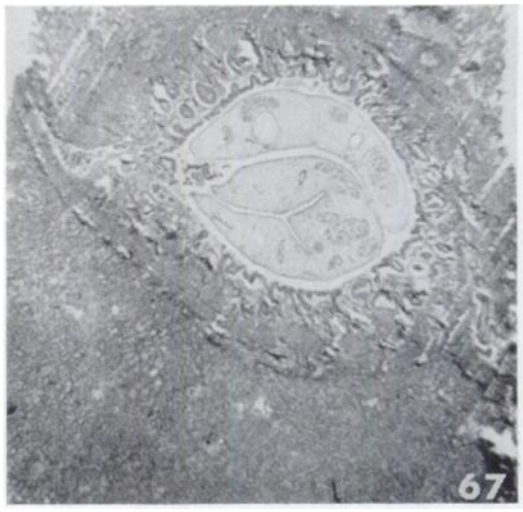
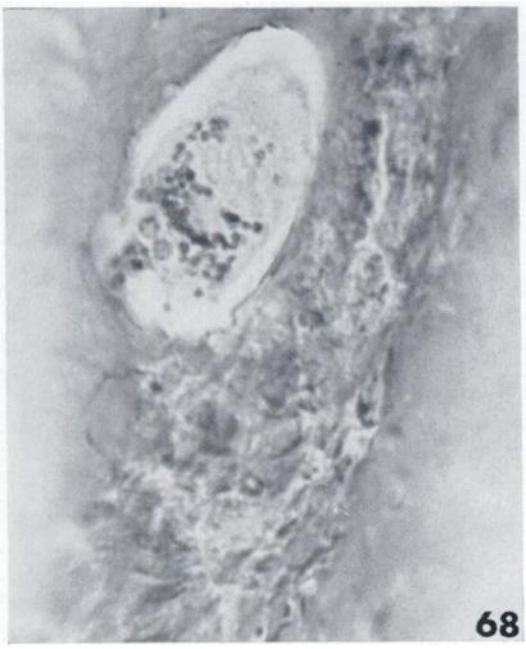
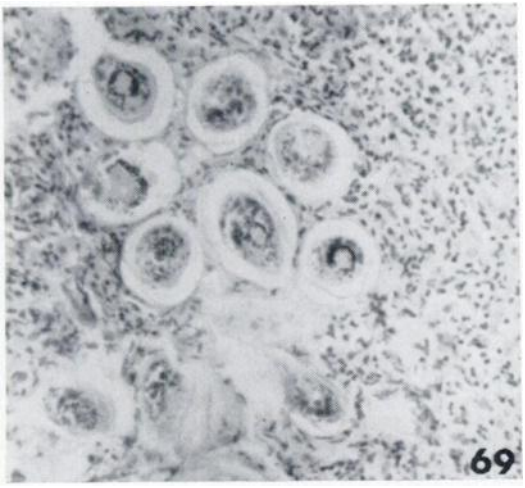
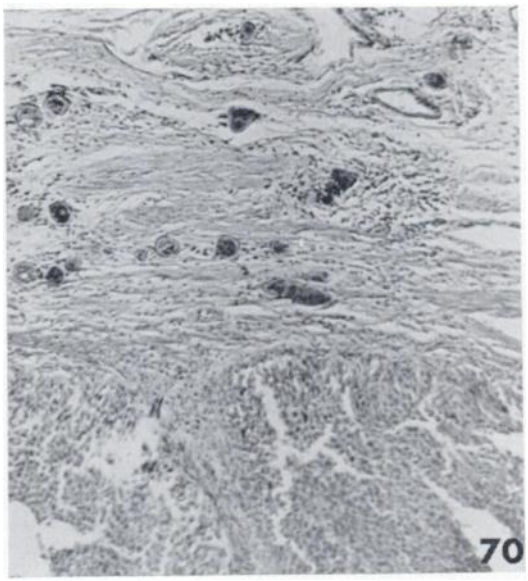


FIGURE 67. Liver section containing *C. sinensis*. The tissue was taken at autopsy after emetine therapy.



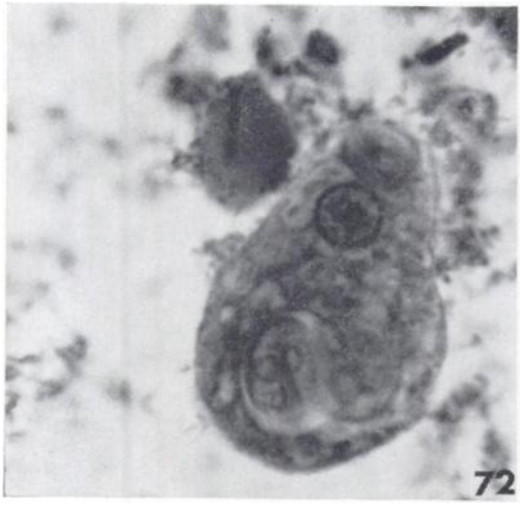


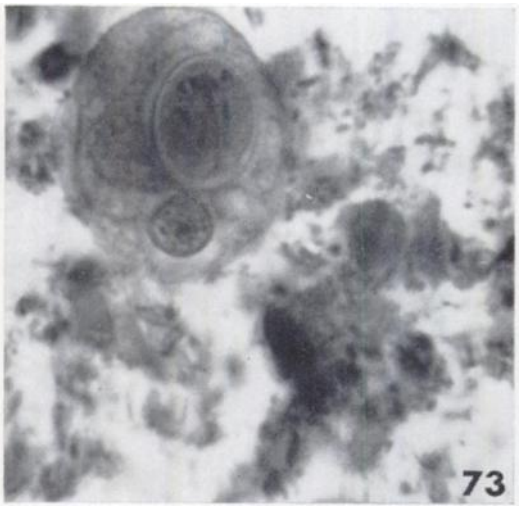
FIGURES 68 and 69. Tissue from bladder and prostate gland taken at biopsy: *S. haematobium*.



FIGURES 70. Kidney section: nephrectomy. Carcinoma and calcified *S. haematobium* eggs.

FIGURE 71. Section of lesion ("chancre") of the penis taken at biopsy, found to be due to scabies.





FIGURES 72 and 73. *Giardia* within *E. coli*

This concludes my recitation of personal anecdotes, which I am sure can be matched or expanded in number and variety by my colleagues in New York or other large cities in the United States. I trust the presentation has interested many of you, amused some, and educated a few.

The lesson one can infer is that parasitism can be found where it is sought and that in large, non-Tropical areas of good sanitation, opportunities exist that permit detailed studies of the clinical aspects, pathology, diagnosis, treatment, and even the epidemiology of exotic as well as indigenous parasitic infections.

I should like to close on a sociological note, especially in Philadelphia, often referred to as the City of Brotherly Love.

There has been a great deal of discussion, effort, and activity to show that all men are equal and that they should live together in peace. Problems of integration in man are not unique but amongst parasites, integration may even transcend genera, and here (Figs. 72 and 73) we see an ameba and a flagellate that have solved the problem.

Thank you.