is but a phase of its therapeutic action; it is the application of the drug to the parasite and not an immunising of the body against the entrance of the parasite we have to deal with; therefore, we may confidently expect that if it will cure a malarial infection it will prevent its development—the development though not the introduction of the germ. Further, that as some types of the parasite are highly amenable to the drug given therapeutically, similarly its prophylactic power will be greater against such; thus we may confidently expect it to be a timely prophylactic as against the benign tertian but less active against the malignant tertian. The value of the drug is apt to be underrated in consequence of its being given in too routine a fashion, and often under conditions in which it cannot be absorbed, as in states of severe gastro-intestinal catarrh. Such failures should be eliminated in assessing its prophylactic value. I should recommend that in future experiments in prophylaxis be made with the aid of the microscope, and in reference to the particular type of malarial parasite it is used against, and also that the gastro-intestinal condition of the individual experimented upon be investigated and recorded.

V.—Lieutenant-Colonel James Cort Marsden, I.M.S., Madras.

Lieutenant-Colonel Marsden said: I have invariably given quinine both as a prophylactic and as a therapeutic agent for the last twenty years, and the results have nearly always been satisfactory; but in reference to hæmoglobinuria, one case I had under my care some years ago made an impression on my mind. It was a private case, of which I have unfortunately lost the notes, and I speak from memory.

The patient was treated at Rajahmundri, the headquarters of a very malarious district; he was a German missionary who had been brought down from the Rumpa Hills. It was a case of malarial fever of the remittent type with the usual symptoms. He was put on quinine as a matter of course, though much against his own wish, as he informed me that the drug had on a previous occasion produced bloody urine. I rather scouted the idea, but the urine shown to me at my next visit was undoubtedly hæmoglobinuric, blood being found by the usual clinical tests, and corpuscles apparent under the microscope. Each time the drug was repeated this symptom was observed; when the drug was omitted the urine was non-hæmoglobinuric. The case did not improve in spite of treatment, cold packing, ice, etc., and the patient died from hyperpyrexia with a temperature of 109° before death.

I may observe that this is the only case in all my service that I have ever observed such an effect produced by quinine. I myself still consider quinine our sheet anchor in malaria in all its manifestations.

VI.—David C. Rees, M.R.C.S., L.R.C.P., Superintendent of the London School of Tropical Medicine.

Mr. Rees said: Quinine was used as a prophylactic on a large scale in Nigeria by the West African Frontier Force in 1898. Unfortunately I have not the figures at hand, but as the quinine was not given under supervision on account of the force being divided into small detachments the figures would not be very valuable. I, however, arrived at the following conclusion, namely, that 5 grs. of quinine administered daily, although that amount does not markedly reduce the number of attacks of fever, lessens their severity and also the case mortality. I do not agree with Dr. Fielding-Ould's experience with regard to the sloughing caused by hypodermic injections of quinine; personally I have never produced sloughing by these injections, but the injection should be administered intra-muscularly not hypodermically, and with careful antiseptic precautions. When I proceed to a malarious country again I shall take 2 grs. of quinine three times a day, as I believe a small quantity of the drug circulating in the blood is more likely to act beneficially than one large single dose.

VII.—C. F. Harford-Battersby, B.A., M.D.Camb., Principal, Livingstone College, London.

Dr. Harford-Battersby stated that from personal experience he believed strongly in the prophylactic action of quinine. He and many others whom he had known had on early visits suffered severely from malaria, but on taking quinine prophylactically he had been free from fever, and others had been greatly benefited. He quoted the case of Mrs. Bishop, the well-known traveller, who in travelling in malarial districts had stated that she took personally and gave to each of her servants a pill containing 1 gr. of quinine daily. None of them had ever suffered from malaria even when they had travelled in company with other expeditions which had suffered severely. As regards the curative effects he urged the importance of giving quinine at the right time. He believed it to be the best course to see that the bowels were opened, and then to give 10 grs. of quinine at the commencement of the sweating stage, but in no case should the administration be delayed for more than four hours after the onset of the disease. He believed that the heroic doses formerly given were a mistake, and brought the medicine into discredit. With reference to possible evil effects of administering the drug, he alluded to the supposed tolerance of quinine, which was believed by some to result from its prophylactic use, and therefore to interfere with its curative use; this he considered to be without foundation. As to the suggestion that quinine produced hæmoglobinuria, whilst this might be possible, he did not believe that it could be regarded as a cause of hæmoglobinuric fever. The fact that quinine was given and had been given in large doses in all parts of the world, whilst West Africa appeared to be the home of hæmoglobinuric fever, which was seldom found in India, was a powerful argument in favour of this view. He regarded the view that quinine caused this fever as a most mischievous doctrine. He related a case in which quinine had cured severe vomiting in malaria and believed that it could be found effectual in curing many symptoms which were malarial in origin although not so commonly associated with malaria. In conclusion he dealt with the method of administration. He had employed Burroughs and Wellcome's tabloids with good results and had never known them pass unchanged by the bowel. He considered it to be of some importance to disguise the taste of quinine as the more nauseous methods of prescribing it might interfere with its toleration.

VIII.—Major E. M. Wilson, R.A.M.C., C.M.G., D.S.O.

Major Wilson said he did not think quinine had much prophylactic effect. In the Ashanti expedition of 1895-6 it was tried and discarded. In Sierra Leone, also, it did not seem to have much effect; in illustration of this he mentioned the case of a white non-commissioned officer to whom quinine was administered by mistake by an orderly for fourteen days, and afterwards the man had fever. He had not found that the subcutaneous injection of quinine caused inflammation, and he had used it in many cases. No doubt Burroughs and Wellcome's tabloids were sometimes passed unaltered. No heroic doses were advisable; 10 grs. at a time were quite enough. He had never seen quinine cause blood to appear in the urine.

IX.—B. S. Ringer, M.D., Canton, China.

Dr. B. S. Ringer narrated a case of blindness due to quinine. A Spanish Roman Catholic priest, living amongst the Chinese up the country, near Amoy in the Tokien Province, had suffered from a severe and prolonged attack of malarial fever, for which he had taken large and frequent, but indefinite, doses of quinine. On arrival in Amoy he found him suffering from dimness of sight, and on the second visit he found him to be quite blind. The fever had, however, disappeared. Ten-grain doses of potassium iodide were then administered, and the sight gradually returned, and was eventually quite restored.

X.—Lieutenant-Colonel C. B. Maitland, I.M.S., Professor of Surgery, Madras Medical College; Senior Surgeon, Madras General Hospital.

Lieutenant-Colonel Maitland asked for information on the result of giving methylene blue in malarial fever. He gave it, in one epidemic, with even better results than from quinine. The drugs were given to alternate cases. No bad effects resulted from the blue, but the men's clothes and sheets became blue, and as the drug was procured with some trouble it was given up. The dose used was 3 grs. three times daily. In regard to the action of quinine on the pregnant uterus, and the teaching that the drug would either set up contraction or would keep it going when once it had begun naturally, his experience was that it could be safely given at any period of pregnancy, both in cases of ague complicating threatened abortion; and in cases

of malaria in pregnant women suffering from some other disease—for example, enteric fever. With reference to the giving of tabloids he had found that the hardest and most thickly-coated tabloid was effectual if broken first and given with a meal. When swallowed rapidly with water there was no taste.

XI.—JAMES CANTLIE, M.B., F.R.C.S.,
Surgeon, Seamen's Hospital, Royal Albert Docks, London.

MR. CANTLIE said: We know so little concerning malaria in infants, and the action of quinine upon the suckling child when administered to the mother, that the following case may be instructive:

A child 3½ months old, born of parents who had long resided in the South of China, but who at the time of the child's birth and afterwards resided in England, contracted a "feverish" attack which lasted 6 weeks, and defied all the usual drugs, change of residence, etc. The child was not teething; the mother was feeding the child wholly until well on in the illness, when cow's milk was given as well as the breast. A rise in temperature occurred every evening, followed by sweating during the night or early morning. As other plans of treatment had proved useless, the mother was put on 4 grs. of quinine thrice daily, and the child on ½ gr. quinine thrice daily. By the third day the child lost the fever and had no return. Examination of the mother's milk for the malarial parasite proved negative.

XII.—EDWARD HENDERSON, M.D.,
Shanghai, China.

DR. HENDERSON said: In the European population of Shanghai the benign forms of malarial poisoning are almost solely represented. No experiments in prophylaxis by the administration of quinine can be quoted as the cases are not sufficiently numerous. A dose of 15 gr. of quinine given in the sweating stage after the temperature had fallen, if followed by a few smaller (5 gr.) doses, is usually sufficient to put an end to an attack. With these small doses cinchonism is rarely troublesome. I have never seen any degree of permanent deafness nor any amblyopia follow the administration of quinine. Children suffer from cinchonism much as adults do if equivalent doses are given, but the effect may easily pass unnoticed from the child's inability to describe sensations. I think quinine decidedly a dangerous drug to give to pregnant women. In the old days I can recall two miscarriages which were produced, apparently directly from large doses of quinine. Neither of the patients—they were both multiparæ—had ever had an accident of the kind before, and in neither case was any tendency shown before the drug was given. I think the effect of quinine can be prevented, or at least lessened, by guarding it with some preparation of opium, or, better still, chlorodyne. Chlorodyne possibly owes part of its value to the Indian hemp it contains besides the morphine. The effect of Indian hemp in checking uterine hæmorrhage is, of course, well known. Hydrobromic acid or one of the bromides might be tried. If, as some believe, these drugs prevent tinnitus, supposed to be due to congestion of the labyrinth, they may conceivably exercise some influence over the circulation in the uterus. Personally I should not care to trust to them alone; they would need to be given in large doses.

XIII.—Major RONALD ROSS, I.M.S. (Ret.),
Liverpool School of Tropical Medicine.

MAJOR ROSS pointed out that in old cases of malaria there might be a secondary form due probably to enlargement of the liver and spleen—a form of a continued type not directly due to the parasites, and not amenable to quinine. This form had been noticed also by Vandyke Carter, Kelsch, Kiener and others, and was observed by the speaker while studying kala-azar. Torti was the first to point out that quinine should be given before the access, and Major Ross cited an example in favour of the view with which he agreed. He considered that the drug should be continued for three months after infection, and that it was best given in solution.

XIV.—GUTHRIE RANKIN, M.D., M.R.C.P.,
Physician to the Seamen's Hospital Society, Greenwich.

DR. RANKIN related a case where hæmoglobinuric fever was contracted about fourteen months after settlement in Central Africa by a young man who, during that time, took no prophylactic.

The patient was invalided home, and experienced a mild attack after his return to England. He returned to Africa after four months perfectly well, and during the following two and a half years he suffered no return of malarial trouble. During the whole of his second residence he took quinine daily, in saltspoonful doses. He was now at home in excellent health, but had suffered for some months from a persistent dermatitis of both hands, which he ascribed to the long use of quinine.

Dr. Rankin wished to inquire whether, in the experience of those who had largely used quinine in the tropics, the widely expressed experience of the absence of cinchonism could be accounted for by the fact of its administration to patients suffering from malaria, because in the practice of every physician at home cinchonism, coming after comparatively small doses of the drug, was not uncommon.

XV.—OSWALD BAKER, M.D. (Lieutenant-Colonel I.M.S., ret.),
Physician, Seamen's Hospital, Royal Albert Docks, London.

DR. BAKER stated that quinine was given in this country in conditions other than malarial fever in doses aggregating 15 gr. daily, extending over long periods of time without any prejudicial effect whatever. He thought the reason quinine so often failed as a prophylactic was because it was not administered in sufficient quantities. He thought it would be desirable to elicit the opinion of this meeting on the subject. He was of opinion the prophylactic dose was the same as the curative dose.

XVI.—Colonel KENNETH MACLEOD, LL.D., M.A., M.D.,
Professor of Clinical and Military Medicine, Army Medical School, Netley.

COLONEL MACLEOD remarked that Dr. Manson had pointed out the importance of using the microscope during the administration of quinine as a guide and check. This was, when practicable, obviously desirable. But the practice involved considerable labour, and in cases in which the parasite was not present in the peripheral circulation might be accompanied with doubt and disappointment. In these cases as Dr. Manson had now reminded them pigment and pigmented leucocytes might be seen. Koch recommended another and more extended use of the microscope as a means of detecting malarious infection in a community. This system of exhaustive examination of the blood of a community, he contended was necessary, because parasites might exist without any pyrexia or other overt indication of malarial infection. This mode of using the microscope was still more laborious, and could only be possible under special circumstances in small communities; but if the extirpation of malaria by means of quinine was attempted it must be resorted to. The use of the microscope in this matter, however important, had its restrictions. Dr. Harford-Battersby had drawn a very important distinction between hæmoglobinuria and hæmoglobinuric fever. It was known that hæmoglobinuria was caused by the administration of many poisons, inorganic and organic, and it was quite possible that quinine might, under certain circumstances and in certain persons, give rise to hæmoglobinuria; but that was a very different matter from quinine giving rise to hæmoglobinuric fever, which was a disease of very definite type, of which the presence of hæmoglobin in the urine was but one of several very characteristic features.

ON THE METAMORPHOSIS OF THE FILARIA SANGUINIS HOMINIS IN MOSQUITOS,

ESPECIALLY WITH REFERENCE TO ITS METAMORPHOSIS IN THE ANOPHELES ROSSII AND OTHER MOSQUITOS OF THE ANOPHELES GENUS.

By S. P. JAMES, M.B.Lond.,
Captain I.M.S., Quilon, Travancore, India.

DR. PATRICK MANSON'S discovery of the metamorphosis which the filaria sanguinis hominis (the embryo of the filaria Bancrofti) undergoes in the bodies of certain mosquitos, has recently been confirmed by Dr. Bancroft in Australia; and I desire in this paper first to make some remarks on the time necessary for this metamorphosis in different mosquitos; and afterwards to describe briefly the experiments which I have carried out on feeding mosquitos on the blood of filariated persons, which prove that mosquitos of the *Anopheles* genus are capable of acting as efficient intermediary hosts for this parasite.

Dr. Bancroft discovered that mosquitos can be kept alive