producers of the smoke nuisance must be compelled to consume their own smoke; a compulsion which will ultimately be a boon to the owners, by the saving of fuel it will effect. Her Majesty's Mint would be no exception to this rule."

Dr. Aaron waged war against the alienation of park lands and open spaces in the city, a war that his successors of to-day still carry on. A modern town-planning committee might have written the following, excepting, perhaps, the comment on the leniency of insurance companies towards policy-holders in the outer suburbs: "It is not long since an attempt was made by a former Government to alienate a portion of one of the 'lungs' of the city for building purposes. It is, however, among the few good things to the credit of the late Legislative Council that this desecration was prevented. Had this species of *tubercular disease* once been allowed to gain a footing, it would not, I fear, have been long before the whole 'lung' would have been invaded. The Cleveland Paddocks, a part of which at least ought to have been reserved for the inhabitants of that portion of the city, have already been sacrificed, and Grose Farm appears to be rapidly following. Fortunately, however, for those who can avail themselves of it, the railroad comes in as a true sanitary institution, since by its means many will be enabled to live out of town, and thus, by spending a large portion of their time, and more particularly that part of it devoted to sleep, in a pure atmosphere, will insure themselves against many of 'the ills that flesh is heir to,' and may also insure their lives at a cheaper rate than their less fortunate fellow citizens."

Like so many of the "old school" of medical men, Dr. Aaron seems to have had many and varied interests. He was for twelve years an enthusiastic member of the Volunteer Force that came into being with the Crimean War. He rose to be Principal Medical Officer. He was for many years Medical Officer to Darlinghurst Gaol and the Police Force. The duties of this office included his presence at executions, and his certificate that the prisoner was "well and truly dead." He was noted for his philantropy, and was associated with many movements for the social betterment of the poor of Sydney. He occupied high offices in Freemasonry, and was President of the Unitarian Church.

Dr. Aaron died at his residence in William-street, Sydney, on 17th August, 1877, at the age of 73 years. He was a pioneer in Australian medical journalism; he was a zealous worker for the improvement of sanitary conditions in Sydney; and for 40 years he practised medicine in New South Wales. In all his activities for the whole of that period the records of his life would indicate that he pursued, in his own words, "an honest and fearless course." We too often neglect to pay homage to the sanitary pioneers of the past, yet the results of the work that they founded are indicated in our improving vital statistics of to-day. The interpretation of public health in simple terms of sanitation is an English tradition that found genesis in the cholera outbreaks a century ago, but has been carried on until to-day in popular imagination and in the statute-books of the English-speaking world. Despite the limitations of such a tradition, there is much to be said for a singleness of purpose in public health reform, for the whole-hearted

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sanitarian like Dr. Aaron probably served ... and saw results more clearly than we who seek ... of vitamines, eugenics, and immune sera.

BALDWIN

Acknowledgments.—These notes have been compiled from scattered references in Parliamentary Papers, from *The Sydney Magazine of Science and Art* (1858), from an obituary notice in *The Australian Practitioner* of 1877, and from an article on "The History of Medical Journalism" contributed by Dr. J. H. L. Cumpston to the *Australian Medical Journal* in 1914. Some references were also supplied by Mr. C. Bertie, City Librarian, through the courtesy of Dr. J. S. Purdy, Metropolitan Medical Officer of Health, and Mr. W. G. Layton, Town Clerk, of the City of Sydney. Unfortunately, every effort to secure a photograph of Dr. Aaron has proved unsuccessful.

Hookworm and Filariasis in Australia.

By A. H. BALDWIN, M.B., B.S., D.P.H., D.T.M. & H., Acting Director, Australian Institute of Tropical Medicine, Townsville, North Queensland.

THE problems of hookworm and filariasis present to the public health worker several features in common. The salient and important facts of the life histories of the causative parasite in both these diseases are well known. Both diseases in Australia are limited to tropical and subtropical areas, the latter area in eastern Australia including the Northern Rivers district of New South Wales. In both diseases, the parasite may be present in persons presenting no signs of disease. These facts have been determined for Australia by the survey method of investigation, and the many-sided problems of control are now being tackled, together with continued investigation and research. The work in the field is carried out by the Hookworm Campaign under the administration of the Division of Tropical Hygiene of the Commonwealth Department of Health, whilst at the strategic points of Townsville, Rockhampton, Toowoomba, and Lismore, the Australian Institute of Tropical Medicine and the Commonwealth Health Laboratories serve as "strong-posts" in providing laboratory and research facilities. But neither of these diseases can be effectively controlled until the general public has learned and believed the facts, has recognized that sanitation, like other applied sciences, has a definite economic value, and has generally developed a sense of communal hygiene.

HOOKWORM DISEASE.

Hookworm disease in Australia has passed through the following stages:—

1. A stage when it was unrecognized and untreated, prior to about 1890.
2. A stage when diagnosis and treatment were in the hands of the general practitioner and when the disease often went unrecognized.

3. The first organized effort, the Queensland Hookworm Campaign, April, 1919-October, 1919.

4. A more comprehensive organized effort, the Australian Hookworm Campaign, with free examination followed by treatment. This period was subdivided into—

   Original survey, October, 1919-December, 1922.
   Control operations, January, 1923-September, 1924.

5. The Australian Hookworm Campaign, under control by the Commonwealth Department of Health working through the Division of Tropical Hygiene.

It is obvious that during the first two periods outlined above hookworm disease had a comparatively unchecked career.

The position at the commencement of the anti-hookworm measures is given in Table 1 below.

TABLE 1.

—	Number, Census.	Number Examined.	Infected with Hookworm.	Per Cent. Infected Hookworm.
Intensive operations	17,864	15,654	3,479	22·2
Surveys and dispensary method	5,198	5,198	323	6·2
Aborigines	1,479	992	803	80·9
Total	24,541	21,844	4,605	21·1

These results obviously called for further work, and the Australian Hookworm Campaign was commenced. The Commonwealth Government, the International Health Board, and the various States concerned co-operated to map out the whole of Australia (and its dependencies) according to rates of infection. The results of this original survey are given below in Table 2.

TABLE 2.

State or Territory.	Number of Persons Examined.	Number Infected with Hookworm.	Per Cent. Infected with Hookworm.
Victoria	2,497	0	0·0
South Australia	3,281	0	0·0
Tasmania	2,209	2	0·1
Western Australia	2,846	308	10·8
Northern Territory	886	148	16·7
New South Wales	23,573	774	3·3
Queensland	167,290	15,472	9·2
Papua	17,905	10,601	59·2
New Guinea	28,234	20,951	74·2
Total	248,721	48,256	19·4

This was distinctly encouraging, as it revealed that Tasmania, Victoria, and South Australia had no endemic foci, and that New South Wales was only infected in the Northern Rivers district and Western Australia in parts of its tropical belt. Even in Queensland and Northern Territory, where the heaviest infections were found, the endemic areas were largely coastal. Owing to the heavier rainfall and large native population, Papua and New Guinea were found very heavily infected.

Following this original survey, a scheme for control operations was elaborated. Briefly, this was a periodical examination of the school children, who would thus serve as a criterion by which the rest of the community might be judged. In Papua and New Guinea mass treatment without microscopical examinations was advocated, to be checked by periodical microscopic examinations of selected groups. Western Australia, having only a small endemic area, undertook the treatment of this through its own Health Department. New South Wales Northern Rivers area was to be examined by the Australian Hookworm Campaign. In the Northern Territory the control operations were to be carried out by the Commonwealth Quarantine Officer. These control operations lasted from January, 1923, to September, 1924, when the Commonwealth Department of Health took over the administrative control. The position at this period is shown in the following table:—

TABLE 3.

Endemic Hookworm Areas in :—	Number of Persons Examined.	Number Infected with Hookworms.	Per Cent. Infected.	Number of Persons receiving Treatment.
Papua	..	..	..	99,213
New Guinea	1,651	794	48·1	177,285
Northern Territory ..	129	57	44·2	77
New South Wales	17,084	1,134	6·6	1,076
Queensland	105,149	7,205	6·8	12,197
Total	124,013	9,190	7·4	289,848

With the Commonwealth control the staff was cut down to two units, and the budget to approximately 40 per cent. of the pre-existing one. The duties now carried out by the hookworm units are of a manifold character.

With the change of administration and the smaller funds available, it was realized that if the money were to be spent to the best advantage it was very necessary that more should be found out as to the actual conditions which in Australia influenced hookworm infection. An attempt is being made at the present time to correlate the varying infection rates, both in rural and town areas, with different types of

night-soil disposal. The work is rendered difficult epidemiologically by the fact that the person as a rule does not know that he is infected till told so after examination, consequently the period of infection is difficult to arrive at. Further, in the areas being worked, the population is very migratory—cane cutters, shearers, meat workers, &c.; further difficulty is experienced by lack of co-operation by the people themselves. All the following situations are constantly met with in the routine work:—

(*a*) A family may refuse specimens for examination;
(*b*) a family may promise specimens but never send them;
(*c*) a family may carelessly mix up their tins;
(*d*) a family may fill all tins from the same specimen;
(*e*) a family may refuse to take medicine when found infected;
(*f*) a family may accept medicine and pour it down the sink.

It will be seen from the above that the officers engaged in hookworm work need both patience and tact, as any exercise of legal restrictions would be most unwise.

The duties of those engaged in this work might here be summarized. By microscopic examination of selected groups they check the hookworm position and find out whether the hookworm rate is increasing or decreasing.

If the results justify it, they carry out an intensive survey from house to house.

They make privy inspections, and, working in collaboration with the local authorities, try to have defective privies improved. They treat all persons found infected, and re-examine them after treatment.

In the event of intestinal parasites other than hookworm being found, they give the person a letter to his own doctor so that treatment for the condition may be undertaken. If required, they advise the doctor so concerned on the latest method of treatment.

They also act in collecting scientific information, insects, &c., in connexion with other diseases of pressing importance. In times of emergency they would be available as a mobile squad for fighting any severe epidemic diseases.

They travel by the best means available—horse, cycle, motor cycle, motor car, coach, train, launch, or steamer.

The work in 1925-26 would seem to indicate that hookworm infection is somewhat like a smouldering fire; it has been checked here, has almost vanished somewhere else, but is suddenly discovered to be spreading in some other locality.

It would be foolish to talk about "wiping out" hookworm infection under present conditions. By judicious methods we can reduce it to an extent when it no longer will be an economic factor in the life of the community.

FILARIASIS.

Filariasis is roughly tropical and subtropical in its distribution. Australia lies on the outskirts of the great Pacific centre for the disease. In this area filariasis is probably more frequent and severe than in any other portion of the globe.

The disease is known to be conveyed in Australia by the mosquito *Culex quinquefasciatus* (*fatigans*), which is a domestic mosquito breeding by choice in foul water, such as drains. Whether any other mosquitoes act in Australia as vectors is not yet known. This possibility cannot be dismissed, as Manson-Bahr in Fiji found *Aëdes variegatus* (*Stegomyia pseudoscutellaris*) a vector, indeed a better vector than *C. quinquefasciatus*, and though we have not this mosquito we have mosquitoes which are closely akin to this species.

Aëdes variegatus has been found at Samarai (Papua). *Aëdes albpictus* has been found at Darwin (Northern Territory) and in New Guinea. Partial development of the parasite has been traced in this mosquito in the Malay States. Development of the parasite has been proved in *Taeniorhynchus uniformis*, and this mosquito has been found in Queensland. *Taeniorhynchus africanus*, a closely allied species, has been found at Cairns, Halifax, and Innisfail. In other parts of the world anopheline mosquitoes have been found to be the principal vectors. This diversity in specificity of vectors must have some meaning, and it may be eventually found that the particular vector for any locality depends not so much on the species of mosquito as on the habits and prevalence of that mosquito at a particular time of the year when temperature and humidity are favorable for the development of the parasite in the mosquito carrier.

Australia is intimately linked with the early history of filariasis. The first adult filaria to be described was found in Queensland by Bancroft in 1877. Scott Skirving described a successful operation for elephantiasis scroti in a case from Camden, New South Wales, in 1884.

In 1901 Low proved *C. quinquefasciatus* was a vector in Australia.

In 1924 Mavis Walker at Brisbane succeeded in infecting *C. quinquefasciatus* from human cases, and also proved that this mosquito was the best vector of those experimented with at Brisbane. Other mosquitoes investigated by the same worker included *Aëdes vigilax* and *Culex annulirostris*.

In 1924 Sweet showed that at Brisbane the periodicity of the microfilariae was nocturnal.

How prevalent is filariasis in Australia?

Flynn of Ipswich reported 60 cases of filariasis with clinical manifestations in the five years preceding 1903. McLean found in Brisbane in 1908 that 10.8 per cent. of hospital patients showed microfilariae in the blood.

The Hookworm Campaign undertook a filarial investigation in 1922, investigating conditions in Queensland, New South Wales,

Northern Territory, and Western Australia with the following results:—

RESULTS OF EXAMINATIONS FOR FILARIA.

—	Number of Persons Examined.	Number Infected.	Percentage Infected.
Western Australia	111	0	0·0
Northern Territory	273	0	0·0
Northern Rivers District of New South Wales ..	203	6	2·9
Queensland—			
Brisbane–Southport District	6,228	227	3·6
Nambour–Maryborough District	1,660	37	2·2
Rockhampton District	354	12	3·4
Mackay District	450	13	2·9
Bowen–Townsville District	2,543	51	2·0
Ingham–Innisfail District	239	6	2·5
Cairns District	900	6	0·7
North-western District	1,177	18	1·5
Central District	177	0	0·0
South-western District	634	3	0·5
Total, Queensland	14,362	373	2·6
Grand Total	14,949	379	2·5

Filariasis undoubtedly also occurs in North-West Australia and the Northern Territory, but only to a slight extent. In Papua and New Guinea filariasis is commoner than in Australia, and elephantiasis is more frequent as a complication than it is in Australia. Fulleborn in 1912 found that in New Guinea various districts had infection rates ranging from 20 to 70 per cent.

The mere presence of microfilariae in the blood causes no disability; it is the complications which sometimes, though not always, follow the activities of the parent worms that cause disease. Such complications include filarial hydrocele, adenitis, orchitis, ascites, chyluria, elephantiasis, abscess, lymph scrotum, lymphangio-varix.

Contrary to common belief, elephantiasis is not the most common complication, at any rate in Australia, but one of the rarest. Filarial adenitis, hydrocele, chyluria, ascites, and abscesses are much more common.

Few realize on account of the slow history and the lack of dramatic incidents, the seriousness of the position, and the economic loss, caused by this disease in Queensland. It is the opinion of a number of old-established practitioners that filarial complications are increasing much more rapidly than can be accounted for by increase in population.

The position is rendered much more serious by the fact that we possess no therapeutic cure for the disease. Therefore to control the disease we must rely on public health measures. What are these? Briefly, the destruction of all breeding-places of the vector, nearly all such breeding-places being kindly supplied by man himself for his

own destruction, and of the nature of empty tins, bad gutters, &c.; the use of mosquito nets, particularly by infected persons; moving infected persons if possible as far south as Sydney, where the disease will gradually die out without the danger of infecting others.

This Department is continuing investigation in the northern areas, and the following points have been considered worthy of consideration:—

1. Is surgical filariasis increasing?
2. What is the domestic mosquito population where filariasis is prevalent?
3. What possible vectors exist?
4. Experimental investigation of these vectors.
5. What is the method by which the larvae enter the skin?

Australian Fish as Mosquito Larvae Destroyers.

By the late L. E. COOLING, Entomologist, Australian Institute of Tropical Medicine, Townsville.

[*Foreword.*—At the time of his death in December, 1924, Mr. Cooling was engaged in a continuance of his study of larvivorous fishes, some account of which, amongst other writings, he had published in *Health** for April, 1923, and in the Service Publication on "Malaria"† by Dr. R. W. Cilento. The following article has been extracted from his notes.]

WE find few references in the scientific literature of Australia calling attention to our larvivorous fish.

Froggat, in 1905, wrote: "If ornamental garden ponds and creeks are stocked with small fish . . . . they will soon devour all the mosquito larvae and pupae as they come along and keep it clear of these pests before they have time to mature."

A slightly fuller reference was made by David G. Stead in 1907:—"In the first case there is not the slightest doubt that most small pond fishes are an important factor in controlling to some extent the supply of mosquitoes, as well as of other insects which possess aquatic larvae, as they prey upon them greedily whenever opportunity offers.

"Amongst our own indigenous fishes, no more inveterate enemies are to be found than the various species of Minnows (Galaxias) which are plentifully distributed throughout the eastern division of New South Wales. These are all highly active, agile, surface-swimming fishes, always on the go and always ready for food; and they are to be found in great profusion in every creek and in almost every natural pond, even though the latter be of very small size. In addition, they are to be seen in very many permanent artificial ponds, such as are found in brick yards.

* "Mosquito-Larvivorous Fishes in Relation to Mosquito Reduction Work in Australia," *Health*, April, 1923, page 94.

† *Malaria, with Especial Reference to Australia and its Dependencies*, Service Publication (Tropical Division) No. 3, page 76.