experiences, and remembers crossing the Tower Bridge and finding it turned at right angles. After recalling this incident the patient was much better, but a few days later he went to the theatre to see *Going Up* (it is true that there is an aeroplane in *Going Up*), and he suddenly found that the theatre was the wrong way round. He went home, and in the middle of the night he woke up with the feeling of disorientation, got out of bed, and went towards what he thought was the window, and put his hand through the looking-glass. Thus he was by no means cured. I pointed out that there must be some memory in the first six years of his life which was the cause of the trouble. He tried to recall it, but did not make much progress. I then put him through his fourth birthday under hypnosis, and he remembered a frightening dream in which he had thought that there was an animal under the table. He had crawled downstairs and waked up half-way down. The next morning he had thought that the pier was the wrong way round, and had told his mother so. I interpreted his dream for him while he was in the hypnotic trance. He had seen the Giant Ape in a glass case at the Natural History Museum, South Kensington. This had frightened him, and it was this creature which he had thought was under the table in his dream. I took the precaution to get another doctor (Captain P. A. Galpin, R.A.M.C.) to come and see me hypnotize this patient the next time. I then suggested to him that he would go through his first experience of disorientation. When I put my hand on his forehead he shouted out, "Hot coffee!" It appeared that, when a child of nearly three, he had gone into the kitchen one morning, and had pulled the coffee-pot, which was on the table, towards him by pulling at the tablecloth. The coffee upset and poured down his right arm. He felt it as a pain in his left side, over his heart. He knew no more until he woke up in bed, when he saw his father come into the room, and he felt the bed to be the wrong way round. That was his first experience of disorientation—the first he could remember. It occurred to me, as a possible explanation of the dissociation, that the scalding of his arm produced a fainting fit, in which he fell to the left and everything twisted round to the right—he fell through a right angle. That was the beginning of his disorientation.

To make quite sure of this I hypnotized him again to bring up an earlier memory still. I suggested to him that he should remember his second birthday. He suddenly began to shout out: "He has bit me—Gordon has bit me!" Before I woke him up, I asked him all about it, but he could not tell me very much whilst in the hypnotic state—he had gone back to a period when he was too young to be able to describe his experiences. I told him that he would continue to remember all that he had just gone through, and I then woke him up. He told me that Gordon was not a dog, but a little cousin of his. They had been in bed together, standing up in bed, and it appears that he had punched Gordon in the face, and that Gordon had retaliated by biting him in the left arm. He could remember that at that time he was living near a Fire Station—could remember all the details of the incident, and could remember definitely that he had had no feeling of disorientation. The revival of this incident brought no memory of any earlier disorientation. The next day after this treatment he felt more disorientated than ever, for he had been going through these experiences very vividly. I let him stay in bed, and after two days he recovered completely, and very soon applied for his discharge. I let him go, but asked him to write to me if the feeling of disorientation ever recurred. I have never heard of him since.

This case seems to me to show that such memories date from very early life, and more than that, it shows that the memories need not always be of a sexual nature, because at the age of 2 even Freud would admit that there can be very little sex, and it is very difficult to see where the sexual experience could come in in such a case.

The other case is a much simpler one, but it is what I would call a crucial case of the value of abreaction, or the working off of emotion under hypnosis. It is the case of a gunner who was admitted to the hospital where I was working, after he had spent two years in military hospitals of different kinds. He was suffering from a tremor of the right hand, dating from the time when he had been blown up at Ypres. He did not remember anything more until he reached hospital, and the memory of this interval

had never been recalled to him by any of the doctors he had previously seen. I sent him to sleep—that took just about three seconds—and then suggested to him that he should live again through the experience of Ypres. He did so, and began to shout out all sorts of things which showed what had happened at the time. Bosch shells were falling nearer and nearer to the gun-pit. He was apparently serving the gun, and someone else was handing him ammunition, and this person had evidently lost his head, for my patient shouted out: "What the — do you mean by pulling the — pin out of that — fuse?" Then I noticed that he was moving the handle with his right hand; his hand began to shake violently, and soon he was shaking all over, but especially in his right hand. Then he suddenly became absolutely still. I suggested to him that he would continue to remember all that he had just gone through and then woke him up. He looked at his hand, which was absolutely still, with amazement, and expressed his gratitude, but his mind still appeared somewhat confused, so I told him to go and sleep it off. An hour later he came back and told me that he had not been to sleep, but that he had been thinking it all over. He knew everything that had happened, and told me that he had not been suffering from shell shock but from gun shock. His gun had been blown up, and the emotion which this experience had excited in him had been bottled up for two years, with the result that he had suffered from this tremor in his hand. The next morning he was able to shave himself with an ordinary razor, for the first time since his illness.

Now, was this working off of the emotion the cause of the recovery? The alternative explanation is that the recovery is due to suggestion. When this man came to me, however, he certainly did not expect me to cure him. I saw him the first day that he came to the ward and treated him at once, and he was not likely to have more confidence in me than in anyone else who had treated him. As regards the hypnosis, he went off straight away without realizing that he was being hypnotized—it was not that that impressed him. As far as one can make out, there was no expectation worked up—it was simply the working off of the emotion that cured him. That is why I call this a crucial case. In many other cases it may be argued that the cure is the result of suggestion—for example, in the case of the disorientated man—but this case of the gunner was not of that sort. I do not for a moment wish to deny the working of suggestion in curing such cases, but I wish to emphasize the curative effect of the working off of emotion as a fundamental factor. It is a more causative treatment than suggestion. Suggestion removes the symptom; abreaction removes the cause of the symptom.

The explanation of psychasthenia, compulsion neurosis, and some of the psychoses, in terms of the same concept of mental conflict and dissociation must be postponed.

In conclusion, I should like to express my indebtedness to Major R. Worth, O.B.E., R.A.M.C., of Springfield War Hospital, for his courtesy in allowing me to report the above two cases, and for his unfailing help and encouragement while I was working in that hospital.

THE IMPORTANCE OF THE HOUSE-FLY AS A CARRIER OF *E. HISTOLYTICA*.

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THE investigation here described was undertaken to determine as far as possible the extent to which the house-fly is a carrier of the organisms causing diarrhoea, dysentery, etc. No one would now attempt to deny that the fly can carry a very large number of different species of pathogenic organisms; the present paper tries to afford some actual statistical evidence of the extent to which it actually does carry them. So far as I know, we have very little real knowledge of the relative importance of water carriage, flies, carrier cooks, etc., either in this country or in any other. The investigation has been carried through in one small area in Amara, on the lower Tigris, between February 1st and November 3rd, 1918,

The sanitation here is, of course, very much better than it is further up the line.

The Gross Figures.—These are as follows:

Total number of flies dissected ...	1027
Number containing "apparent faeces" ...	645 = 63 %
Number containing human intestinal parasites ...	42 = 4.09 %
Number containing <i>E. histolytica</i> cysts ...	3 = 0.3 %

The intestinal parasites, as will be seen later, are eggs of worms and cysts of protozoa. The "apparent faeces" which is recorded in 63 per cent. of the flies dissected requires explanation. A fly was recorded as containing "apparent faeces" if its gut contained brownish material enough to be seen by the naked eye, and if on being made into a film the brown material agreed in its appearance with human faeces. Generally it was swarming with bacteria; often one observed portions of partially digested muscle fibres (proving that the faeces, at any rate, was not that of horse or sheep); or one found the characteristic thick-walled cells which appear in the stools of Indians after a meal of dhal (pulse); or groups of yeast stained blue with iodine which are common in human stools in this country. I have frequently found these yeasts in conjunction with such distinctively human parasites as hook-worm eggs. Moreover, the fact that I never found a cyst or egg of any parasite of dog or ox or horse suggests very strongly that the faeces found in the fly was human in origin; and if over 4 per cent. of the flies contain eggs or cysts of definitely human parasites there is nothing unreasonable in believing that 63 per cent. of the flies contain human faeces. One must, however, admit that there is no one criterion which enables us to state that a given substance is human faeces; even the demonstration of the presence of *Bacillus coli* in each of these flies would have been useless, as that organism inhabits the intestinal tract of many vertebrates.

Difference between Male and Female Flies.

It soon became clear that flies from different situations would contain faeces and human entozoa to very different extents, and also that the males were very much cleaner than the females. As the relative abundance of the two sexes varied much in the day's catch, I determined to exclude males altogether from the dissections in order to obtain a uniform basis for my statistics. The relative cleanness of the sexes is shown below:

Males:	
Number dissected ...	206
Number containing "apparent faeces" ...	67 = 33 %
Females:	
Number dissected ...	165
Number containing "apparent faeces" ...	107 = 65 %

These figures appear to indicate that the female is twice as much a carrier of faeces as the male. As a matter of fact the disparity between the sexes is greater even than this, because the average male recorded as containing faeces often contained but a fraction of the amount one would find in the average female. The above figures are strictly comparable, as in them I have only included males and females taken at the same time and place.

Females from Various Situations.

The females alone will now be considered; the total figures are as follows:

Total number of females dissected ...	796
Number containing "apparent faeces" ...	568 = 71 %

The great majority of these females fall within five groups:

Group I, those taken in or on British fly-proofed latrines 100 yards or more from any incinerator. Group II, those taken on or in latrines immediately adjacent to an incinerator. Group III, those taken in one particular British cookhouse and mess 80 to 100 yards from an Indian latrine and incinerator. Group IV, those taken in Indian latrines with incinerators alongside. Group V, those taken in Arab compounds of the lower class.

The system of sanitation provides approximately fly-proof latrine seats with lids for British troops, the walls and roofs rendering the inside partially dark. For Indian troops latrines with any form of lid are impossible to arrange owing to caste; the Indian latrines consist of separate urine and faeces tins on the ground, between two foot rests, with screens of matting and mud and a light roof. The latrine, whether British or Indian, in the

great majority of cases is close to the incinerator, which is a brick cone with a grid about 3 ft. from the ground; a door about 2 ft. square is provided for loading dejecta, etc., upon the grid, and two or three small holes on different aspects for admitting the wind; the top of the cone is truncated, leaving a smoke vent about 2 ft. across. These incinerators burn fairly well even if there is no breeze. Trench latrines and the burying of any form of refuse except that from slaughterhouses have long ago been abolished.

The system of sanitation in Arab compounds, so far as it can be said to exist, is as follows: There is a great deal of promiscuous defaecation, particularly by children, and before dawn by low-class adults, in courtyards and roads, and, above all, on the flat housetops. The Mesopotamian sun is only sufficient to render this practice harmless during four or five summer months; in fact, by September isolated deposits of faeces are not only fed upon by swarms of flies, but actually afford breeding places for *Sarcophaga*, etc., and by October for *Musca* itself. Apart from this promiscuous defaecation, all the low-class compounds from which the flies in Group V were collected possess a shallow, partially open cess-pit in the corner of the yard. Dejecta are dropped into an open, sloping trench, and slowly pass down into the pit itself. It is also customary to make basin-shaped holes in the earth in front of the door of each hut, and in these to place household rubbish, partly decomposed vegetables, faeces, etc. It will, I think, be realized that the presence of a number of these compounds close to a military area tends to nullify the efforts of those in sanitary charge of the area. The better class houses in towns are kept much more clean, and have completely closed cess-pit latrines, which cause very little annoyance.

The figures for flies from these five types of locality are as follows:

Group Number and Locality.	Total Number Females Dissected.	Number containing "Apparent Faeces."	Percentage containing "Apparent Faeces."
I. British latrines, no incinerators	99	39	39
II. British latrines and incinerators	80	57	71
III. British mess and cook-house	198	119	61
IV. Indian latrines and incinerators	155	118	76
V. Arab compounds	201	161	80

The difference in dirtiness between flies in Groups I and II is due to the fact that burning in the type of incinerator I have described is so slow that numbers of flies may frequently be seen inside the incinerator feeding on such material as is not directly in the smoke. I think my figures show that these incinerators are an important leak in the system of sanitation; it appears that the fly-proofed latrine for British troops is moderately efficient, but as it is frequently placed next one of these incinerators, in which the flies feed freely, the fly-proofing of the latrine seat becomes a mockery. One concludes, then, that the provision of a door to close the hole through which the incinerator is loaded is an urgent necessity. Of course the burning of faeces on an open grid incinerator is still more strongly to be condemned. There is no reason why sheet-iron doors should not be fitted to these cone incinerators in areas at the base and on the lines of communication—in fact, such doors are often fitted, but only used as draught regulators.

As regards the flies from British cookhouses and messes (Group III), the great majority of these flies were taken in one mess and cookhouse about eighty yards from an incinerator and latrine, and up-wind of it when the prevailing north-west wind was blowing. It is rather disquieting to notice that 61 per cent. of the flies from this group contain faeces. As a matter of fact, 5 of these 198 flies contained cysts of human intestinal protozoa, one of them the cyst of *Entamoeba histolytica*.

The Entozoa.

Human intestinal parasites, referred to shortly as entozoa, were found in 42 different flies. This is 4.09 per cent. of the whole number.

The entozoa comprised representatives of ten species—two cestodes, four nematodes, three protozoa, and the organism known as *Blastocystis*. All the species are well-known parasites

of man, and the great majority of them are not known as parasites of other animals. Of the 42 flies in which one or more of these organisms was recognized 39 belonged to Groups I to V; in these groups the flies shown to contain entozoa were distributed as follows:

Group:	I.	II.	III.	IV.	V.	Total.
Total flies examined ...	59	80	198	155	201	733
<i>Hymenolepis nana</i> ...	0	0	0	0	1	1
<i>Taenia saginata</i> ...	0	1	0	0	0	1
<i>Ankylostomum duodenale</i> ...	0	0	0	1	2	3
<i>Necator americanus</i> ...	0	0	0	0	1	1
<i>Strongyloides stercoralis</i> ...	0	0	0	0	1	1
"Ankylostomes" ...	0	0	0	3	0	3
<i>Trichiuris trichiura</i> ...	1	1	0	0	0	2
<i>Entamoeba coli</i> ...	1	8	3	5	3	20
<i>E. histolytica</i> ...	0	2	1	0	0	3
<i>Giardia (Lamblia) intestinalis</i> ...	1	2	1	1	0	5
<i>Blastocystis</i> ...	0	1	0	0	3	4
Total flies containing entozoa	2	13	5	8	10	39

Note.—The totals at the foot of the table do not equal the sum of the figures above them, because some flies contain more than one sort of entozoa.

The detection of cysts of *Entamoeba histolytica* only three times in over a thousand flies might at first be taken as evidence that the fly under the conditions studied is of minor importance as a carrier of amoebic dysentery. On the other hand, it must be remembered that it is impossible to remove the whole amount of faeces contained in a fly; if a given fly contains but one or two cysts, it is quite possible that these may escape detection. One must further remember that it is by no means easy to see the cysts at all in some films, owing to the presence of the globules described below; also, even in the absence of these globules, a single cyst must often remain undetected behind a mass of debris. It may safely be said, then, that 0.3 per cent. by no means represents the number of flies carrying cysts of *E. histolytica*. We should certainly be nearer the mark if we surmised that the actual percentage was 0.5; possibly it may be higher. Now this represents a very large number when it is remembered that the fly is found throughout the year in Mesopotamia, and that in spite of the excellence of the sanitation of most units in the area, the fly is abundant in messes and cookhouses every spring and autumn. Probably up the line the percentage of flies carrying cysts is higher, as the conservancy is necessarily less perfect.

The identification of the eggs of *Ankylostomum duodenale*, *Necator americanus*, and *Strongyloides stercoralis* rests, of course, on measurements. The egg of *S. stercoralis* was 93.6 μ in length and relatively more elongate than that of the other species.

Technique.

The flies were dissected in the ordinary way, as described by Patton and Cragg.¹

The legs and wings are removed, the trunk is placed on a slide in saline solution, and the head cut off with a needle sharpened like a scalpel. The trunk is then steadied with a blunt needle, while with the sharp needle small incisions are made dorsally and ventrally in the abdominal wall. The tip of the abdomen is then pulled away from the rest of the body and the gut and crop gradually unravelled on the slide. After fragments of fat body, Malpighian tubes, etc., have been pushed aside, those lengths of gut which seem to contain faeces are isolated by cuts from the scalpel needle. The faecal contents are expressed from this as far as possible at one spot on the slide; the crop is also opened at the same place. The contents are flooded with Gram's iodine solution and covered and examined.

During a certain stage of the digestive processes of the fly globules are poured out by the gut epithelium into the gut contents. These globules have an oily appearance and do not closely resemble a cyst, but being round and approximately the size of cysts they make examination of the film extremely slow; in examining an ordinary film

from a stool the trained eye very quickly picks out any round body for further study; in examining a film from a fly this may be rendered quite impossible owing to the presence of many round bodies in every field. Pathologists differ as to the advisability of treating ordinary stool films with iodine; there can be no doubt that in examining films from the fly iodine is almost a necessity, as it enables one very rapidly to distinguish between cysts and globules. In carrying out this work I have never recorded any body as an amoebic cyst unless it had been treated with iodine, to render the cyst wall and nuclei clearly visible. A number of doubtful cysts were seen early in the investigation; they have not been included in the figures. I have not found either fluorescein or eosin of any value in enabling me instantaneously to detect a cyst among a number of globules. Practically all the amoebic cysts have been examined also by Captain G. Lapage, R.A.M.C., and passed by him. His very wide experience of these bodies has been of the greatest use to me; whenever he has been doubtful about any object which I have submitted to him I have excluded it from the statistics. The investigation was begun in conjunction with Lieutenant J. H. Woodger of the Norfolk Regiment and continued for a short time by both of us. I have presumed on his kindness and included a number of his dissections in the statistics, transfer to an isolated force preventing all communication between us. I am very grateful to them both.

The flies examined have all of them been house flies—that is, they would all have been referred to as *Musca domestica* a few years ago. A great number appear to be referable to the species or races now known as *Musca determinata* and *M. angustifrons*; but the whole question of species in the house-fly group is now under revision, and it is probable that new species will be found when the flies of Mesopotamia have been examined along the lines of Awati's² work in India. From the public health point of view the exact systematic position of the insect appears to be immaterial. The habits of all these races appear to be the same as regards breeding in faeces and feeding upon it and upon human foods.

Vomit Spots.

Early in the investigation about fifty were examined with negative results; time failed to examine a large number.

The occasional presence of eggs of worms and cysts of protozoa in the vomit and faecal deposits of flies has, of course, been demonstrated, especially by Wenyon and O'Connor.³ A transfer to another country has prevented me from carrying through a similar investigation on the carriage of pathogenic bacteria by the fly in this area.

Conclusions.

(a) As has already been shown by Wenyon and O'Connor,³ one may expect to find the egg of any human intestinal worm, or the cyst of any protozoan in the fly if only one looks long enough.

(b) It appears that in a well-sanitized area in Lower Mesopotamia over 60 per cent. of the flies carry human faeces, over 4 per cent. of them actual human entozoa, and probably at least 0.5 per cent. the cyst of *Entamoeba histolytica*.

(c) One is justified therefore in regarding the fly in this country as not only a potential, but an actual and major factor in the carriage of the bowel disorders which are here so regrettably numerous.

REFERENCES.

- ¹ Patton and Cragg: *Textbook of Medical Entomology*, Madras, 1913.
- ² Awati: *Ind. Journal of Med. Research*, vol. iii, p. 510.
- ³ Wenyon and O'Connor: *Journal of the R.A.M.C.*, vol. xxviii, 1917, No. 6, p. 694.

THE triennial meeting of the International Society of Surgery will be held at Paris instead of Brussels this year from Monday, July 19th, to Friday, July 23rd. The subjects set for discussion are: (1) The surgery of the heart and great vessels; (2) the treatment of tumours by radium and x rays; (3) the analysis of the blood and its biological reactions in surgical affections; (4) fractures of the femur; (5) the prophylaxis and treatment of tetanus. The subscription is 50 francs. Members of the medical profession who wish to be nominated for election are requested to communicate with Sir D'Arcy Power, K.B.E., 10A, Chandos Street, Cavendish Square, W.1.