Orlando to pin verses on to trees. At the first glance all these activities seem equally remote from the primitive, efferent function of the instinct; but they have in common the one fact that they advance the purpose of the instinct. This does not necessarily imply conscious endeavour to a foreseen end. When such endeavour is present we may (apart from malingering) get the phenomenon of the self-inflicted wound, which is an example of the intelligence usurping the entire conative functions of the instinct of flight.

This parallelism of the activities of the reasoned and unreasoned conations, producing in each case the same result (namely, illness), is a point that seems interesting to note, and can be matched in the play of other instincts besides that of flight.

In the study of the most common functional or "hysterical" troubles outside military life the instincts of self-abasement and self-assertion should be recalled.

Self-abasement, with its emotion of negative self-feeling or subjection, is evoked by failure in the primitive human occupations—war, love, reproduction—and by pain and fear. Its conative activity consists in crouching, cringing, or slinking attitudes of body, or (in the civilized) of mind. Its object seems to be the propitiation of a superior power or the eliciting of sympathy or pity; it is well seen in the whipped dog. An interesting human example was seen by the writer in the case of a Tamil marker who, being accidentally shot on the range by a soldier, fell on his knees and salaamed repeatedly to the man who had shot him. One does not often witness the bodily exhibition of the instinct among civilized people, though the mental equivalent is very common. If the instinct of self-abasement is successful in gaining the sympathy or consideration which is its object, it is liable to change in a curious way into the instinct of self-display. If the cringing dog is given a few words of encouragement it immediately starts exaggerated gambols and friskiness, and becomes animated by impulses directly opposed to those that at first kept it cringing and shivering at its master's feet. The case of over-servile persons will readily occur to the mind as an instance of the same thing in the mental sphere. The instinct of self-display or self-assertion is chiefly evoked by success in the primary human activities, such as war and sport, love and reproduction. Its affective side, positive self-feeling or elation, is pleasurable; but its conative side, which consists simply in conduct known to boys as "showing off," does not seem to be of any great service to the individual or species. The point that should be noticed in both the instinct of self-display and self-abasement is the frequency with which they operate in close association with the sex instinct. This perhaps explains the original purpose of self-display.

Returning to the etiology of "hysterical" manifestations, we find that the symptoms (aphonia, monoplegia, analgesia, or what not) are commonly found to follow an incident such as an unfortunate love affair, the discovery of a disease of the reproductive system, or a terrifying and painful occurrence. Here we have those factors which evoke the instinct of self-abasement—failure in love or reproduction, fear and pain. The goal of the instinct is to elicit pity, sympathy, or attention from other people. In modern civilized life the best way to do this is to be ill; for the primitive conative activities of crouching, waiting, reading of garments, putting dust on the head, etc., no longer impress the public as of old, and may even excite ridicule. Accordingly the patient exhibits symptoms that often go with organic disease, and can sometimes hardly be distinguished from the latter even by an expert. That such phenomena can be seen apart from any voluntary origin, is shown by the fact that the symptoms are very often of a kind that are not under voluntary control at all, such as excessive hiccoughing, local vasomotor disturbances, spasm of the oesophagus, and the other visceral manifestations of hysteria. These activities of the instinct of self-abasement are often seen to awaken (when successful) the instinct of self-display and the manifestations of positive self-feeling, in the manner alluded to above in the case of the dog. In other words, the patient, from being humbly miserable, comes, under the influence of wondering and sympathetic friends, and perhaps of the zealous physician, to take a pride in her symptoms and to derive undoubted gratification

from showing them off and developing new ones. Hence the value of isolation treatment.

As, when surveying the involuntary disorders arising under the instinct of flight, we saw in self-inflicted wounds a parallel phenomenon guided by the intelligence, so in the "hysterical" class we observe conditions such as dermatitis artefacta, apparent fasting, alleged anuria, etc., which are all instigated by purposive intelligent conation.

The scope of suggestion in the production of functional troubles has not, so far, been mentioned. Some authorities, notably Babinski, attach extreme importance to it. There is no doubt that it often determines the type of symptom that arises. For instance, a slight injury to a limb may be followed by a monoplegia. A difficulty in swallowing during painful emotion, especially when accompanied by weeping, may initiate the globus hystericus. But it is here suggested that as imitation and suggestion play such a very large part in the causation of normal conduct, we should admit that they may have the same part in producing hysterical behaviour, without being the original causes of it.

In conclusion, how does the theory put forward in the preceding observations agree with the Freudian hypothesis? The school of Freud appears to explain morbid functional disturbances by supposing that the natural conative activity of an instinct (always the sexual) is liable to repression by the censorship of the moral nature or of education. The normal conation being thus in abeyance, the energy of the affect is transferred to an abnormal conative disposition, and functional disease follows. In this connexion it is interesting to turn again to the animal world. There we find beetles which, instead of running away when frightened, sham death; and birds which, under the influence of the parental instinct, develop a functional paralysis of a wing. What in these cases is the censor that represses the normal conative activity of the instincts, and what determines the exceedingly useful conative disposition that shall become linked to the affect; and could such repression of the conation and transfer of affective energy be transmitted to offspring as intact dispositions? The difficulty of answering these questions has led to the hypothesis advanced in these notes.

Summary.

1. Men and animals alike are swayed by a purposive impulse in their fundamental activities, and this impulse, or teleological striving, can be studied in the conative aspect of the instincts. In many animals instinctive behaviour consists in quite simple reactions, but we also find animals, especially insects, in which the behaviour is extremely complicated. We do not know in the least how this complexity of animal behaviour is produced, but there is reason to believe it is due to something different from human intelligence.

2. In man the complexity of his instinctive behaviour is due partly to intelligence and partly to the same cause that modifies the primitive responses of the animal.

3. It is here suggested that certain functional diseases often represent the modified conative activity of primary instincts—especially of flight, self-abasement and self-display; and that "hysteria" is an example in man of the complications which conations, originally simple, are known to undergo in animals.

THE USE OF X RAYS AS IMMUNITY-RAISING AGENTS BEFORE AND AFTER OPERATION FOR CANCER.

BY

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POST-OPERATIVE x-ray treatment in breast cancer is generally regarded as right and proper, but it appears necessary to emphasize the fact that before operation a peculiarly favourable opportunity is presented for treatment by radiation. The knife may be a means of disseminating stray cancer cells, but if, before the possibility of such dissemination occurs, we can bring about either (1) the

weakening of the malignant cells or (2) an increase in the resistance of the body tissues as a whole—or, better still, both of these desirable results—then the chance of successful colony formation by the parent growth will be much reduced. There is very good reason to believe that these favourable pre-operative conditions may be established by means of suitable x-ray preparation.

It has been shown experimentally that mouse cancer which has been exposed to radium or x rays is grafted with difficulty, or not at all, into fresh tracts, and that an animal which has been suitably irradiated is resistant to cancer grafts. There is also some clinical evidence which suggests that x rays have a helpful action in cancer, no matter to what part of the body they are applied. Such action can scarcely be exercised otherwise than through the blood. Morley Roberts would have us believe that cancer is the result of abnormal growth due to disturbed hormone balance; which disturbance is reflected in the composition of the blood. Certainly we know, on the one hand, that a few cases of cancer of the breast appear to have cleared up under thyroid administration; also that x rays powerfully affect the ductless glands, and have an influence on the cellular elements of the blood, and possibly on its plasma.

Such speculations, however, carry us beyond the intended scope of this article. The important point is that x rays act as much by their stimulating or regulating action upon the body, locally or generally, as by direct depression of cancer cells. Radiation undoubtedly has a deleterious effect upon embryonic cells, and in so far as cancer cells approach this type they are injured by it before normal cells. To this extent the action is "specific" in the same sense as quinine is a "specific" against the malaria parasite—that is, the parasite is injured by doses which have little or no effect on the cells of the body. So with mercury and salvarsan in syphilis.

But, apart from the treatment of rodent ulcer, which does not tend to metastasize, the general stimulating and regulating action of x rays is of more value than its "specific" local effect upon pseudo-embryonic cells. We may speak of the process in general terms as "raising the resistance" to cancer. That the general resistance can be so raised has been conclusively proved so far as mouse cancer is concerned. W. S. Bainbridge¹ quotes Murphy and Norton, of the Rockefeller Institute, as follows:

They found that the chief characteristic of a failing heteroplastic graft in the unsuitable host is a marked local accumulation of lymphocytes. The histological position was found to be identical with that noticed in a failing cancer graft in an immune animal of the same species. Synchronous with the establishment of the cancer immunity, and during the period in which the lymphocytes are accumulating round the cancer graft, there is a lymphocytic crisis in the circulating blood, this being observed in actively immunized animals as well as those possessing a natural immunity, but being totally absent in animals susceptible to the cancer graft. If this lymphocytic crisis be prevented in immune animals by previous destruction of the lymphoid elements by the x ray, the potentially immune animal is changed to a susceptible one. Leaving out of consideration the complicated question of the direct effect of x ray on cancer they studied this artificial method of producing a lymphocytosis in relation to the resistance of mice to their own spontaneous tumours.

In order to do this they removed the cancer, and then subjected the animal to a stimulating dose of the x rays. A graft of the original tumour was then immediately replaced in the groin of the animal. The same procedure, with the omission of the x rays, was carried out in control animals. In others, as a further check to the experiments, the cancers were removed and exposed directly to the same amount of x ray that the animals of the first group had received, a graft of the tumour being then returned to its original host. An x-ray dose they found which produced a lymphocytosis when administered directly to the animal, was sufficient to render 50 per cent. of the mice so treated immune to a return graft of their own tumour; and, in the other 50 per cent., greatly to retard the return of the disease. A similar dose given to the cancer direct outside the body did not influence the subsequent growth of a graft of this tumour when returned to its original host.

These observers considered that, if this pronounced result could be obtained with one stimulating dose, it is probable that a more pronounced effect might be obtained by a second exposure to x ray after a suitable interval.

In man the immunity produced by x rays is not, however, specific, as the same treatment will cause great improvement in the subjects of tuberculosis, or, for that matter, of various other sorts of microbic infection.

A consideration of these facts should lead to clear ideas of what may be and what ought not to be expected from

x rays in cancer. In so far as their effect is a direct one upon a localized growth, they are an alternative to other local procedures, and each case must be judged upon its merits. Rodent ulcer practically always, and sarcoma sometimes, should be treated by radiation. The case as between x rays and radium must be decided by their local results, and these in turn must be judged against those of surgery, diathermy, etc.

But when we come to final issues we have the question of raising immunity—in other words, it is only in so far as we can aid the body to resist fresh invasions that we prolong life. The immunity produced by x rays is partial and non-specific, and it has yet to be proved that that induced by radium is any different in quality or quantity. Where a wide distribution of radiation is desirable, as in the treatment of breast cancer, the practical advantages of x rays over radium are generally admitted, even by those who believe that the latter would be preferable, were it to be had in abundance.

The local superiority of radium in cancer of the lip and of mucous membranes in general is undoubted, but unless the general increased resistance is of a different type from that produced by x rays, hopes based upon the employment of radium in large quantities would appear unlikely to be fulfilled. At the present moment we possess x-ray apparatus capable of giving a practically unlimited output of rays, but no great advantage accrues, as it is easy to push the dosage to a point at which the general resistance is actually lowered.

Even quite recently I have seen questions in the medical press as to the desirability of using an agent in the treatment of cancer which can actually induce the disease. The best answer to this is to be found in a consideration of such a drug as arsenic. Arsenic is of the utmost value as a tonic, and in certain diseases of the blood, the nervous system, and the skin, yet excessive or too prolonged dosage involves a risk of neuritis or dermatitis, or both. In x-ray therapy it is important not to exhaust the response of the system. "Staleness" to x rays may ensue even before the danger point is reached. Therefore, in my opinion, a single course should not exceed two months in length, nor should another be given until an equal interval of time has elapsed.

But although clinical experience teaches that a favourable response continues to be elicited by x rays for many weeks, this does not mean that the full period should be used in pre-operative raying. We must ask: What is the minimum time in which an appreciable effect can be produced in a breast cancer? My experience in this matter is derived from (1) cases of recurrence in the other breast, after operation; (2) tumours in old people when operation is refused or not indicated; (3) a few rare instances when cancer coincides with some condition such as cardiac trouble, where the risk to life of surgical measures is too great. I have no hesitation in saying that a definite effect can be produced in less than three weeks.

By this I mean that the lump is visibly smaller, and pain, if present, relieved. This result is accomplished by six to eight sittings spaced at intervals of two to three days. The doses are comparatively small, and no visible skin reaction is produced. The effect, in the writer's opinion, is rather of resistance-raising than of direct injury to the growth. This makes it all the more valuable, as we desire to render the body in so far as possible generally immune, so that the settlement of any cancer cells freed by the knife may be opposed, no matter where they may be carried by the blood stream. Also, no matter what the cause may be of the shrinkage of the tumour, there can be little doubt that its component cells will be less able to establish themselves in new surroundings than they were before this shrinkage began.

The fact that a case has received pre-operative treatment does not in any way modify the obligation to give post-operative irradiation. But this may be safely delayed for a month—that is, until the patient is about again.

What can be said against the procedure advocated? The visible good effects of x rays upon cancerous growths where operation is contraindicated are beyond doubt. There is no evidence that pre-operative raying in any way interferes with the healing of the wound. The sole argument against the procedure must therefore be that it delays operation for two to three weeks. But this argument, to be valid, implies a belief that the cancer, although improving to the eye—which cannot be denied—is never-

theless spreading in the depth. While this might be so with improper technique, as by limiting the rays to the tumour itself, it cannot happen during the "stage of response" provided that a wide cone of rays is used, so that practically the whole chest, neck, and upper abdomen are exposed. The rays must also be filtered through at least 3 mm. of aluminium, and be highly penetrating. Under these conditions a growth which has already spread to the mediastinum can often be beneficially affected, so that it is almost inconceivable that any deep spreading should occur in the circumstances under discussion.

Nothing which has been said here is to be taken as meaning that the growth would not ultimately spread, in spite of x-ray treatment, supposing no operation to be done. Why this should be so we do not understand. But it appears that after a time the tissue response fails, as it does to arsenic in pernicious anaemia. Hence the necessity for operative removal, whenever possible, before the crest of the wave of improvement under x rays has been reached.

It is obvious that if we can increase resistance to cancer by x rays, we should do so after operation as well as before. Although we do not know what is going to happen in any individual case, we know that in a large percentage of all cases operated on for cancer of the breast, recurrence—or, at any rate, further growth—will occur. The rate of recurrence is estimated at 40 per cent. by the optimists, up to as high as 80 per cent. by the more pessimistically inclined. But even if we side with the optimists, two out of every five cases are certain to go wrong. So little do we know where the recurrence will occur—whether in the breast, in the stomach, the liver, spine, or ovaries—that a local effect, even though widely spread beyond the original site of the disease, must in itself be insufficient in many cases to prevent disaster. But the production of a general immunity is well worth aiming at. It may soon be possible, by using blood tests as criteria, to gauge scientifically the dosage at each sitting, the number of sittings in a course with their spacing, and finally, the intervals between successive courses.

Meanwhile, so long as we are not dealing with actual recurrence, we must be very careful to give too little rather than too much. The present writer feels that the possession of powerful apparatus has of late years led to unduly heavy dosage for prophylactic purposes. The experimentally verified fact that small doses of x rays raise immunity to cancer, whereas large ones decrease or abolish it, will, if kept carefully in mind, at least safeguard the radiologist from transgressing that fundamental therapeutic precept, *nil nocere*.

REFERENCE.

¹ The Cancer Problem and the World War, *Practitioner*, xcviil, pp. 229-230; The Effect of X Rays on the Resistance to Cancer in Mice, *Science*, 1915, N.S., X, 411, 842.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

FATAL POISONING BY WATER DROPWORT
(OENANTHE CROCATI).

THE following case of poisoning by *Oenanthe crocata* is of interest because of its rarity and rapid course:

A single man, aged about 40, had for many years shown slight mental abnormality; I had seen him eighteen days before his death, when he was despondent and believed that he had committed some unforgivable sin. When summoned to him at 3 p.m., on April 24th, I found him lying on the floor of his bedroom; his face was bloated and livid, the eyes fixed and staring, and the pupils were dilated, his breathing was laboured and stertorous, and the pulse feeble. Blood-stained froth escaped from his mouth, and he was totally insensible and violently convulsed. Lying under his bed were a large number of roots, which when broken emitted a nauseous somewhat mouse-like odour like that of hemlock. When the convulsion had ceased the teeth were prized open and the stomach was repeatedly washed out with tepid water; the washings contained particles of vegetable debris, and had also the characteristic odour of hemlock. Lavage was continued until he had another violent and prolonged convulsion; when this had ceased respiration and circulation rapidly became fainter, and stopped ten minutes after my arrival. It appeared that he had gathered the roots in the early forenoon. He went to bed at 1.30 and an hour later was noticed to be restless and twisting. This was the first convulsion; he had two others before my arrival and was unconscious during his remaining three-quarters of an hour of life.

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Examination of the roots showed them to consist of a series of tubers, varying from two to ten in each plant, some of them oblong, smooth, and succulent, others thinner and more fibrous and tapering, like bunches of small parsnips, for which they are apt to be mistaken. Their colour was yellowish-white, and when cut across were found to be dotted over with little brown pin-head spots, the whole becoming yellow on exposure to the air. They were quite characteristic of the plant variously known as *Oenanthe crocata* (the classical name, from *oinos*, wine, and *anthos*, a flower—owing to the vinous scent of the flowers), "hemlock water dropwort," "horsebane," and "five finger root." It is also called "water hemlock," but this name is more accurately applied to an allied poisonous plant *Cicuta virosa*, or "cowbane." *Oenanthe crocata* is one of the most virulent of vegetable poisons, more deadly even than the more familiar *Conium maculatum*, or "spotted hemlock." It contains "oenantheotoxin," which causes convulsions by its action on the spinal medulla. The symptoms in this case were quite typical.

The plant is very common along the banks of ditches and small streams in this neighbourhood, where it is familiarly known as "leech-bow." It has on several occasions in recent years caused the death of cattle, and a more remote instance is on record in which it proved fatal to a number of stranger seamen who partook of its roots under the impression that they were a harmless kind of parsnip.

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DIURNAL ENURESIS IN A CHILD: TREATMENT
WITH GALVANISM.

A. A., aged 5 years, had suffered from frequency of micturition during the day only, and never at night. A fortnight after an attack of measles she had great frequency of micturition, passing water every five minutes. This was treated for a fortnight with increasing doses of belladonna, and then for a week with belladonna and lycopodium. The condition slightly improved; she then passed water about every twenty minutes, but no further improvement could be obtained. She was ordered small doses of iron, and galvanism was applied for ten minutes to the suprapubic region. After the first application the frequency was diminished to once an hour, and after the second application to once in two hours and a half. This was two months ago, and there has been no return. On each occasion two cells of the battery were used. The amperage was not measured, as my dynamometer is away for repairs.

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HEAT HYPERPYREXIA.

I SERVED with the Indian Expeditionary Force during the summer—May to August, 1916—at Nasireyah on the Euphrates; as the troops were in tents and hospital reed huts we had not the luxury of electric fans or punkahs.

I was attached to a combined field ambulance as second in command, and had charge of the European cases coming into the field hospital.

The treatment that my commanding officer and I adopted was as follows: Our brigade was holding one bank of the river. We dug a trench 6 ft. long by 8 ft. broad and 4 ft. deep, and covered it with reeds. The majority of cases of hyperpyrexia came into hospital between 4 and 6 p.m. The rectal temperature was never less than 108° F. As these cases came in unconscious and cyanosed, on stretchers, they were placed across the trench and I injected $\frac{1}{2}$ grain of strychnine and then proceeded with artificial respiration and the lavage. I had relays of orderlies lent from the battalion, who poured water over them. The trench very quickly filled, so that the patients' bodies were immersed except their heads. The rectal temperatures fluctuated a good deal, so that it was never safe to stop the douching until the temperature remained fixed at, but never lower than, 101° F. An invariable sign of recovery was vomiting. After the patients had recovered consciousness they were immediately removed into one of the hospital reed huts, and thin calico sheets wrapped round them—heads and trunks. I posted orderlies who passed down the lines of patients and