a somewhat similar condition of mind is not uncommon in men, as 54 men had murdered their own child or children out of the 303 men so detained for murder.

Murder under these circumstances—that is, where an atmosphere of melancholy and foreboding becomes accentuated into an overpowering and insane sense of dejection and self-recrimination—more often than not occurs in the morning; while the opposite condition, revengeful suspiciousness and insane aggressiveness and excitement, involving captious self-assertion, possibly under the influence of drink (exaltation), is more likely to lead to murder late in the day or after midnight hours.

The occasional *morning* evanescent wave of gloomy dejection, and the occasional *ultra-roseate* and absurdly sanguine *evening* point of view are phases of self-introspective experience not unfamiliar to our normal selves. If either of these phases were to last indefinitely and persistently, we would in time become unfit for our work, and goodness knows what might happen.

Obliviousness of the Act.

A profession of obliviousness of the act (amnesia, forgetfulness, loss of memory) is often had recourse to as an expedient by prisoners in cases of murder, but it is an indication fraught with the gravest suspicion, and medical men ought to place no reliance upon it as a sole indication that the case is one of epilepsy or insanity. The prisoner usually in time, and when it suits him, is able to give a detailed account of the circumstances. Single and simple automatic acts are often completely forgotten in drink or epilepsy, but I am bound to say that in all my experience I have never been able to satisfy myself in any case of drink or insanity where murder has been committed that the recollection of a series of purposive and exceptional acts extending over a number of hours, and involving preparations for the murder and including all the circumstances of the act itself, has been absolutely and completely obliterated from the memory. Confusion and incompleteness of memory regarding some portion or portions of the circumstances connected with the act may certainly occur, but that is a totally different matter.

B. W., a soldier, was under sentence of death and afterwards hanged at Chelmsford for the brutal murder of the woman he was keeping company with. Dr. Brayn and I held a statutory inquiry by direction of the Home Secretary. At the commencement of our interview the prisoner assumed an aspect of stupidity and of incapability to understand our questions on the most ordinary matter of everyday life, and his replies were disjointed, calculated, and evasive. Later on, however, he gave up this attitude and talked more to the purpose on subjects that had no connexion with the murder itself. He told us about meeting and walking with the deceased on the evening of the murder. As we approached the circumstances leading up to the murder he completely "dried up," and indignantly and persistently denied having murdered her, avowing that he had no recollection whatever of the allegations made against him. We told him that the judge and jury were satisfied of his guilt, and that he had better think it over during the night and tell us about it in the morning. He, however, left us with an offended air, saying his word had never been disbelieved before. In the morning, after we spoke to him of the seriousness of his position, he broke down and told us in detail how he carried out the murder.

H. W., a drink case without insanity but with assumed obliviousness. This was a very bad and complicated murder where, having, against my own convictions, been persuaded by the prisoner that he had no recollection of the murder or the circumstances connected with it, I gave evidence to that effect at the trial, saying that although much under the influence of drink he was not insane. He was found guilty on abundant evidence and sentenced to death. Being anything but satisfied on the obliviousness in the case, I obtained permission from the Home Office to have another interview with the prisoner. I reasoned with him for a long time, and it was not till I caught him tripping that he gave way and told me the whole details of the murder in every particular, working himself up into a state of great excitement.

Feigned Insanity.

Malingering, imposture, and feigned insanity have to be guarded against, as they are sure to be "tried on" in many cases. They require tactful dealing when suspicion arises. As a rule the prisoner overacts the part and gives himself away.

Medical men should not be too ready to see insanity and give the prisoner the benefit of the doubt, merely because they feel that protracted examination may prove useless. The impostor not infrequently excites suspicion by a bad habit of repeating the words of the question put to him in

order that he may have time to think what is the best kind of answer to give. Besides this, there are many little things in the manner of the prisoner and his mode of response that contribute to detection.

A. B. was convicted and afterwards hanged for the murder of a woman with whom he had cohabited for years. A plea of insanity was set up, and the superintendent of the asylum and the medical officer of the prison gave evidence that he was insane. He was, however, sentenced to death. Dr. Brayn and I held an inquiry, and found that the indications of paralysis and imbecility were feigned. We reported to the Home Office that he was an impostor. The medical officer of the prison said he certified insanity because the asylum superintendent had done so and because he "hated these hanging jobs."

A Family History of Insanity.

A family history of insanity (often of the flimsiest sort), which is often advanced by well-meaning relatives and doctors, cannot be regarded as being of value in helping us to ascertain the prisoner's condition of mind at the time of the murder or his motive or object in committing it. If we first find the man to be insane, such a family history may come as corroborative and be useful later on in dealing with him.

Alleged Predisposing Causes.

Anomalous predisposing causes are also urged as evidence of mental derangement. Convulsions (fits) when teething, blows on the head and injuries when at school, severe effects of scarlet fever, measles, etc., are seldom any helpful guide to us in medico-legal cases. When a prisoner has advanced to manhood or middle life, has married and taken up positions of responsibility, childhood troubles rarely weigh for much.

Multiple Crimes.

Multiple murders and murder with attempted suicide must each be taken on their merits, different values *qua* insanity being given according to the circumstances of the case and the mental condition of the prisoner, and the motive where found.

Provocation and Premeditation.

Provocation and premeditation are points that have to be considered in any complete statement of the circumstances under which a murder has been committed.

MALINGERING.*

BY

SIR JOHN COLLIE, M.D., J.P.

THE question of feigning or exaggerating illness has of late attracted considerable attention in this country, but it is a mistake to suppose that the condition is of recent origin. Those who have to advise insurance companies know that exaggerated and fraudulent claims are, at any rate, as old as the accident laws. The reason for the prominence the matter has now attained is that many of the approved societies under the National Insurance Act have taken fright and become obsessed with the idea that excessive sickness claims from this cause must inevitably lead to serious financial embarrassment. On the other hand, there are those who emphatically deny any tendency on the part of the working classes to exaggerate or feign disease. It obviously would be unscientific to attempt to form any estimate of what the triennial valuation will disclose based merely upon the results of three or six months' working of the Act; therefore no one knows, or indeed can know, which view is correct until sufficient statistics are available. However, it may be safely assumed, judging from the experience of the Workmen's Compensation and Employers' Liability Acts, that it will be necessary to take special precautions for the prevention of malingering when dealing with thirteen millions of insured people, nearly half of whom, prior to the passing of the National Insurance Act, had not in any way been insured against sickness.

To most medical men the simulation of disease presents a difficult, almost insoluble, puzzle, for in ordinary medical practice such cases seldom occur; but those who have the

* Read at the Section of Forensic Medicine, International Congress of Medicine, London, August, 1913.

administration of the Insurance Act must ever keep an open eye for the possibilities of fraud or quasi-fraud.

A malingerer has been defined as "one who feigns sickness, or who (deliberately, knowingly, and wilfully) induces or protracts an illness with the object of avoiding duty, claiming money compensation, exciting sympathy, or from any other reason." Now the out-and-out malingerer who fills this definition is as rare as he is interesting, and his unmasking should not be very difficult. The process of accumulating data to expose fraudulent cases often resolves itself into a battle of wits between the medical examiner and the so-called patient. Fortunately, in most cases it is a contest between knowledge and ignorance, and in such matters the ignorant are very heavily handicapped. Examinations in these cases, apart from the routine investigation of the various systems, can follow no set rules; the method of meeting the various difficulties as they arise are only learnt by long and sometimes bitter experience; difficulties are met at almost every turn for which academic training gives little preparation. Effective assistance can frequently be obtained by simple means such as the following case illustrates:

A woman was condemned by a house-surgeon to wear for many weeks a back splint for an alleged stiff right knee. I removed the splint, and directed her to sit down and take off her right boot; meanwhile, I eagerly plied her with questions as to what exactly happened at the moment of the accident—whether the company's servants had been becomingly polite, what she said, what they said, and so forth—all of which was no business of mine. It was intensely interesting to her, however. She forgot the present and lived in the past, removing her boot in the usual way as she spoke—that is, she crossed her legs and bent her knee!

Straws show how the wind blows. On two separate occasions, after examining plaintiffs, with the medical assessor before the judge in his private room in the course of a trial, I have given the necessary turn in favour of the defendant by pointing out that whilst the man declared he had a limp, the soles of his shoes were equally worn.

Few as the cases of absolute malingering may be, if they escape detection for any length of time they have a material bearing upon any fund from which they may be drawing. I will venture to quote a case where quite minor injuries resulted in the payment of a large sum of money.

A workman bruised his leg and dislocated his thumb whilst at work, for which he received prompt treatment. His employer's doctor nine months later, and on several subsequent occasions, certified that there were no objective signs of injury to his leg and that he voluntarily kept his thumb stiff. The man continued to receive compensation for seven and a quarter years, at the end of which period I saw him. He complained of stiffness and continuous pain in his leg, and brought with him his son, who he insisted should valet him as if he were helpless. Prolonged and exhaustive examination revealed no reason for incapacity. He made many attempts to frustrate my examination, keeping his leg stiff, and describing the necessary manipulation as "inhuman." Although he complained of intense and continuous pain on attempting to move his thumb, there was no muscular wasting such as would have occurred had his complaint been genuine. X-ray photographs confirmed my diagnosis that he was a rank impostor.

His employer having learnt that he frequented certain swimming baths had him watched, with the result that he was seen swimming and diving, and dressing and undressing himself.

On my advice the employer stopped payment, the case was taken to court, and the judge, who was assisted by a medical referee, made an award terminating the weekly payments from the date of my examination. From the date of the accident to the time of the decision he had received sick pay amounting to some £290.

I may remark that it was the aggressive and ostentatious way in which this man asserted his complete inability to undress and dress himself that first aroused my suspicions.

I have given much attention to the question as to why it is that so many of the working classes can be accused of not acting fairly by their fellows, in that they either feign sickness or, after a genuine illness, linger on the threshold of work. The vast majority of those who give the impression of shamming, and are classed as malingerers, are people who, although they have to work, are of poor physique, and their standard of health is, at best, far beneath the normal. This is especially so with women. It is interesting to note that in the cutery as to the unexpected demands upon the sickness funds much has been attributed to female workers, of whom four millions

are compulsorily insured. Those who thoughtlessly assert that malingering is rampant, and mainly confined to women, have lost sight of the necessity of having ample data before right conclusions can be drawn; and also of the fact that as the same results often proceed from different causes, there is therefore a liability to attribute a result to the wrong cause. Before the passing of the National Insurance Act there were thousands of women, many of them badly underpaid, constantly employed in the hard grind of daily toil, who were wholly unfit, and the passing of the Act was their emancipation, because it will ultimately entail their drawing permanently on the sickness benefit fund. It should also be borne in mind that low wages conduce to frequent sickness. A large number of women wage-earners do not earn enough to keep them in health. The Board of Trade returns show that 10s. to 15s. a week is about the average in the lace, hosiery, woollen, cotton-winding, and silk-weaving trades. Whether the societies to which these women belong were wise in admitting them does not now concern us, but who will blame these underfed, ailing, dispirited toilers if they claim the sickness benefit to which they have a right under the Act, and for which they have been compelled to make contributions?

It is also no secret that in the competition between approved societies large numbers of weakly males who ought to have been post-office contributors were eagerly sought after and enrolled.

It often happens that, in addition to the payments under the National Insurance Act, a man is in receipt of weekly allowances from one or more clubs, and the total amount of his income when he is on the sick list is actually more than when he is working.

An infinitely larger class than the out-and-out malingerer will be found to consist of those who are by no means intentionally dishonest, but who nevertheless remain long on the sick list as a result of an introspection which savours of cowardice, a bad heredity, or a pessimistic temperament. Of these not a few come perilously near to fraud. It is in the proper supervision of this class that millions of pounds can be saved per annum by a strong, resolute, and conscientious stand on the part of medical men. In a large number of cases introspection and subjective sensations are unwittingly fostered, and a condition is brought about which is of psychogenic origin, and does not rest upon the physical disability itself, but upon the *idea* of the disability, which in its turn is dependent upon the personal equation and the personality of those who are associated with the patient. To many the temptation of obtaining week by week money which has not been worked for is irresistible; unearned increment has a fatal fascination for all classes. The idea that they are entitled to have, as they say, "some of their own back" when, as too often happens, the disability from which they are suffering is a comparatively trifling one, will be found to account for a certain proportion of the illicit demands made on sick funds by those whose complaints are begotten not of disease but of covetousness.

The problem frequently presents itself for solution: Is the patient a wilful malingerer, or the victim of the psychical conditions consequent upon an accident or illness?

Psychologists tell us that we conceive only that partial aspect of a thing which the individual regards, for his purpose, as its essential aspect. What is considered essential varies, of course, with the point of view of the individual. For instance, a piece of chalk is looked upon by different people according to the use to which it is put: The geologist thinks of it as the cemetery of millions of animalculae; the schoolmaster as a messy but useful aid to imparting knowledge; the chemist, as a carbonate of calcium. In short, the essential quality of a thing is its worth to the individual, and its value to him is its power to serve his private ends.

It must be remembered that sick and injured workmen belong to a class whose education is incomplete, and that they are peculiarly unfit to take a detached view of themselves, especially when ill. Too often the essential aspect of their case is the value unconsciously put upon their abnormal sensations in so far as they influence the continuance of sick pay.

If an introspective, self-centred workman is unfortunate

enough to find himself entitled, when sick, to the material advantages before mentioned, he is much to be pitied; for he is subject to temptation that many, even in a class whose antecedents and traditions are not his, succumb to. It is impossible for him to think impartially.

Many working men of fair education, who in ordinary matters can reason quite logically, and whose mental equilibrium is properly balanced, seem to be congenitally incapable of appreciating ordinary moral obligations when it rests with them to decide whether they shall or shall not return to work. Much would be gained if the working classes could be brought to appreciate that self-respect, self-control, and a return to work when able are of more service and more lasting value than a continuance of doles from a State-aided fund.

Some are pseudo-neurasthenics for medico-legal purposes; others are hysterics with not a little guile. Many are professional valetudinarians, and how far they differ from real malingerers is an ethical point of great subtlety. As a rule, they have a small mental banking account, little sense of responsibility, very little idea of the proportion of things, and are quite ignorant of the fact that the only true happiness lies in work.

This class is likely to be a diminishing one, for time works wonders in teaching even ignorant people to view things in their proper perspective.

Another class who may well be dealt with in this category are those nervous people who are generally given to self-examination, and unconsciously foster subjective sensations which their stronger and better balanced neighbours would ignore. The idea of an illness or an injury obsesses them. Their pains are real, but often only psychic. Such people are victimized by their unstable nervous systems, and too often they make no stand against introspection.

We know that cerebral tissue holds the master key of all the functions. Who would deny that mental anxiety and worry tend to leanness?

The impressions which are written on the brain cells by some physical or chemical process, of the exact nature of which we are ignorant, are stored by the million in the cortical tissue of the brain. Our ideas and impressions come to us from without. Intuition, I believe, plays but a small part in our mental processes, and outside influences and associations determine what we are and what we shall be. Normally when we reproduce impressions they are by no means as vivid as they were originally, but some brains can produce an impression so as to almost visualize it. This has an important bearing upon the mental attitude in the class of case I now propose to consider. Our mental processes are such a conglomeration of subconscious operations and conscious thinking, that it is difficult to understand exactly what foreruns conduct, otherwise it would not be difficult to understand the psychology of the fraudulent mind. At any rate we are fully cognizant that groups of thought run along the line of least resistance, and that every repetition makes the trodden path more passable. That these become to some extent automatic, and are reproduced with but a trifling stimulus, is well illustrated by the story told of the veteran who, upon a wag suddenly shouting in a stentorian voice, "Attention," was promptly brought to a standstill with his hands in the orthodox position, forgetful of the fact that he had been carrying with both hands his dinner rations which had just been served out to him.

All our minds are to a large extent suggestible, and in many cases the best chance of restoration to a life of usefulness is to obtain a readjustment of the master sentiment, and thus redirect the mind's activity.

Whether we slavishly follow suggestions made, or resist them, depends very largely upon whether our volition is strong or weak. That we are all largely dependent upon suggestion for our conduct will, I think, be admitted.

In too many cases a desire to live a life of idleness induces men of the working classes to conjure up memory pictures so persistently that the repetition becomes a habit. People of this class have little innate power of inductive reasoning, and by the mere process of repeated thought unconsciously educate themselves. Sympathy feeds the flame, and contemplated legal procedure engraves deeper and deeper on the brain cells what *should* be the phantom memory picture of an accident, the real physical disabilities of which have long since disappeared.

Too often the pains and aches, the loss of sensibility, and the nocturnal neuralgias are but the echoes of a former injury; they have no pathological entity, and are but functional in nature.

It is a mistake to suppose that the inhibition of the higher controlling centres, the loss of self-control, and the habit of visualizing memory pictures of past painful sensations is found exclusively in the highly strung and delicately nurtured. My experience is that the stolid, respectable working man, when taken out of his normal somewhat humdrum existence and placed in a suitable environment, is quite as likely to react to his surroundings and, as a result, ultimately succumb to the temptations of the pettifogging lawyer. In the event of an accident to such a man, if he receives for several weeks in a large public institution the kindly ministrations of a skilled doctor and trained nursing staff, and finds himself the object of much sympathy and many anxious inquiries by genuinely distressed relatives, he is in an exaggerated state of impressionability, and therefore becomes an easy prey to the suggestion of the rascally solicitor's touts, who so frequently, by various devices, obtain an entrance to the hospitals.

The receptive capacity of many people depends upon the quality of the dogmatic assertion of those who are endeavouring to make an impression on them. The broken-down members of the legal profession may be trusted in their capacity of sham legal advisers so to degmatize that they insidiously teach the commercial value of an accident and of the supposed benefit accruing from the unearned increment. Fortunately, psychotherapeutics is now taking a prominent position in scientific medicine, and the susceptibility to external impressions to which I have just referred is taken advantage of in the modern method of treatment which is adopted for the cure of such cases. This is the golden thread which runs through the illuminating argument of Dubois's work on psychic treatment of nervous diseases. The mental effect of suggestion as a curative agent, combined, as it now is, with the detachment of the patient from the sympathetic environment of injudicious friends, and the scientific study of the mental processes of his case, is the method now adopted by all scientific physicians in Europe, and can be seen in daily practice in all our hospitals where functional nerve disease is treated.

The masterly way in which patients are seductively led from their morbid mentality and made to view themselves and their surroundings in a proper perspective has always called forth my admiration.

The treatment is necessarily institutional; it consists for the most part in complete isolation from relatives, absolute rest in bed, abundance of good nutritious food, massage, electric baths, and bright and tactful nursing. The curative effect is marvellous. As a rule, severe cases take several months, but I have had many cases where a comparatively short residence in the hospital has been successful. The result in the majority of cases can be confidently counted on.

Occasionally—rarely indeed—a sudden cure is effected in this class of case, but the fact that sudden cures *do* occur goes a long way to prove that the pathology is of a psychic and not a physical character.

To a layman a paralysed limb implies organic disease, and it is with the greatest difficulty that one can convince the non-medical mind that functional disease connotes no destruction of nervous tissue, but is merely a local manifestation of a functional inactivity of the brain cortex.

The following story illustrates my point:

Some years ago a lad of about 15 was admitted to one of the large London hospitals suffering from contraction of his hamstrings, which he had had for two years. He sat in bed all day, and slept all night with his knees drawn up, and was apparently unable to straighten them. On several occasions he was given an anaesthetic, and the joints at once relaxed, but immediately contracted again on his recovering consciousness. At 4 o'clock one morning the house-surgeon was urgently summoned to see the patient who occupied the bed next to the boy's. He had been seized by an acute attack of mania, and was wildly gesticulating with a knife. Several nurses were attempting to restrain him, and others were engaged in securing the knife. Another patient was in an epileptic fit from sheer fright, and the boy with the useless knee-joints had suddenly jumped out of bed and run downstairs! The interesting point is that the boy was made to live up to it, and was permanently cured.

The fright, the abrupt introduction into a totally new environment, the horror of the situation, suddenly brought into activity the set of cells whose duty it was to originate or inhibit nerve activity, but whose latent potentialities could not be called into action without a powerful stimulus.

We have seen that in addition to the malingerer who can properly be so designated there are several classes which are either on the border-line or, but for careful discrimination, would be so placed. The general practitioner will now find himself frequently confronted with the complex problem of classifying such cases.

When a case is confidently diagnosed as malingering the treatment is simple, it cannot be too drastic. It may be that in the fullness of time the underfed and overworked class will disappear; until that happy day arrives the medical man will still have many difficulties in dealing with this problem. Those who are on the borderland of fraud require an appreciation of their position, and a possible indication that in the velvet glove there is an iron hand. Far more difficult is it to deal with the introspective, imaginative, and pessimistic class, but the exercise of that moral stimulus which medical men possess can work wonders.

It is a mistake to think that all malingering is the outcome of deliberate wickedness. Because a man does not return to work as soon as one thinks he ought, it is harsh to assume that he is a shammer and should be branded as a wilful malingerer. Such a view is not only unjust, but demonstrates a poor knowledge of human nature. Great allowance has to be made for the personal equation. Moral responsibility, even amongst the highly educated, is a variable quantity; indeed, it almost varies as much with different individuals as do the features. We cannot always fully appreciate the mental processes taking place in each individual mind, and so long as we are bound to weigh all the circumstances of each case, if we wish to be fair. The mental attitude of workmen with regard to recovery after sickness is a very complicated one, and it is only by studying and fully understanding it that one can successfully deal with such cases.

THE SCIENCE COMMITTEE OF THE **British Medical Association.**

REPORT ON URINARY ANTISEPTICS.*

BY
ANSON JORDAN, M.D., F.R.C.S.

INTRODUCTION.

URINARY antiseptics are drugs given by the mouth with a view to disinfecting the urine and the urinary tract. They form an important class of drugs, and one to which a new and most valuable group (urotropin and its derivatives) has been added within recent years. In the case of these drugs we are not concerned with obscure actions upon diseased tissues or a disordered metabolism, but with the simple fact of the production of antiseptic substances in the urine. Consequently it is obvious that a great deal of valuable information as to their mode of action and relative efficiency may be obtained by purely experimental laboratory work.

By growing bacteria in the urine of a person taking the different drugs they may be standardized and compared in the same way as any other antiseptics, while by varying the acidity and alkalinity of the urine information as to the effect of this most important factor upon the action of the drugs may be obtained, and it was upon these lines that the work to be described was undertaken.

One method of estimating the antiseptic power of the urine after taking these drugs would be to add it to cultures of the organisms, but another, which is far preferable since it closely imitates the actual conditions, is to

grow the organisms in the urine itself, comparing their behaviour in urine after taking the drugs to that in normal urine. It was this latter method which I adopted. It necessitated a preliminary investigation upon the growth of the bacteria used in normal urine, and the effect of acidity and alkalinity upon that growth and the results of this will be first recounted.

The organisms I selected for the experiments were the *B. coli* and the *Staphylococcus pyogenes aureus*. They were grown in the urine in pure culture, and were chosen as representing two common types of organism present in urinary infections. It is, unfortunately, impossible to work with either the tubercle bacillus or the gonococcus owing to the uncertainty of cultivating them.

In addition, in each case I investigated the "putrefaction" of the urine when simply incubated in unsterilized vessels—since this "putrefaction"—the result of infection with mixed non-pathogenic organisms of all kinds—is the condition which is present usually in the common cases of cystitis due to infection of residual urine in patients leading a catheter life, and is probably more practically important in this connexion than the cases of "pure" infections of the urine.

The drugs I have investigated are as follows:

1. Hexamethylenetetramine and its derivatives (urotropin, helmitol, etc.).
2. Sandalwood oil.
3. Salicylic and benzoic acids.
4. Boric acid.
5. Uva ursi and arbutin.

METHODS.

I made use of my own urine for the experiments. It was tested before and after the work, and found to be normal to the ordinary clinical tests—that is, as to reaction, specific gravity, and absence of albumin, sugar, and deposits. The diet, exercise, and mode of life were kept as far as possible constant at the time, so that the results are strictly comparable. The complete twenty-four hours' specimen was collected from morning to morning, and samples of that of the previous twenty-four hours used in each day's work. In the determination of acidity it was found convenient to take as an arbitrary standard a "degree of acidity," which may be defined as the amount of acid in 10 c.cm. of a urine of specific gravity 1020, which will exactly neutralize 1 c.cm. of decinormal soda, using phenolphthalein as the indicator. The urine was diluted ten times with distilled water to make the colour less obvious. The first definite change of tint was taken as the end point. The degree of acidity is then found by taking the amount in cubic centimetres of decinormal soda required for 10 c.cm. of the given urine, and dividing it by the number, beyond 1,000, in the specific gravity of the specimen, and multiplying by 20. Thus urines of different specific gravities are reduced to a common level. For example, suppose a urine of specific gravity 1015 required 2.8 c.cm. of decinormal soda, then the acidity is $2.8 \times \frac{20}{15}$. By this means, as was pointed out by Joulie, the acidity is given in terms of the total solids, and not of the bulk of fluid.

I am of course aware that this direct titration of alkali does not give the true acidity of such a mixture of acid salts as the urine, nor the amount of any one acid constituent, but it is the only simple and accurate method of determining the urinary acidity, and it gives reliable comparative results. In alkaline urine the degree of alkalinity was found by adding excess standard acid and titrating as above.

The acidity and alkalinity was varied by taking acid sodium phosphate or potassium citrate respectively by the mouth. In certain experiments with sandalwood oil and with salicylic acid the acidity was increased or diminished by adding directly to the urine known amounts of NaH_2PO_4 or Na_2HCO_3 . By this method specimens of different acidities can be obtained more readily than by the more laborious method of taking each drug by the mouth and sterilizing each specimen of urine; and, moreover, it was found experimentally that this method was satisfactory—that is, the same results were obtained as if the drug had been taken by the mouth.

The various drugs were taken by the mouth for periods of three to five days, and specimens of urine were not tested until the drug had been taken for at least twenty-four hours. In those experiments dealing with putrefaction the urine was incubated in chemically clean but

*A portion of the work here described was done under a grant from the British Medical Association.