most instances hemiplegia, and in some with convulsions and unconsciousness, were in greater or less degree recovered from. In some the recovery was complete. One man had three attacks of paralysis, at 82, 85, and 86; and one woman, in addition to several attacks of unconsciousness, had left hemiplegia and convulsions at 78, paralysis of the left hand at 82, and severe apoplexy at 89, after which she was able to get about again, though with weakened mind and a liability to epilepsy.

While considering this point we do not forget that in the aged person the brain is gradually and progressively shrinking, and the interspace between it and the skull caused by this shrinkage is being filled by fluid effusion in the subarachnoid or pia mater tissue; and there may be temporary irregularities and imperfections in this compensating adjustment of pressure of fluid on the surface and of the blood circulating in the interior, which would to some extent account for these cerebral attacks, and also for the recoveries from them. The senile alterations in the arterial coats must also be an important item; but our knowledge of the physiology of the cerebral circulation is at present scarcely sufficient to enable us to make clear deductions respecting its pathology.

In only 11 out of the 340 returns of men between 80 and 90, and in only 1 of the 92 returns between 90 and 100, is *Prostatic Disease* said to have existed; in one of these it had existed several years, and in others two, three, and four years respectively. In one the affection is said to have given less trouble than formerly. The condition of retention relieved by frequent use of the catheter may be extended with care over many years; but the enlargement of the prostate, with its associated bladder-symptoms, is, I fear, a malady from which recovery, even in old age, is scarcely to be expected. It is something to find that our reports confirm the view that it is a malady from which age gives, after 70, a gradually-increasing exemption.

Fifty-two were troubled with *Rheumatism* in some of its many forms, which include pains in the limbs, aching in the bones, etc., for which, I suppose, a remedy is not very easily to be found. Indeed, it is difficult to define precisely, or clearly account for, the various pains, rheumatic and other, which old people often complain of, and which disturb their comfort without materially affecting their health. The women suffer from these even more than the men, probably in consequence of the nervous system in them being more on the alert; 5 of the men and 6 of the women had gout, all these being between 80 and 90.

Two cases of *Senile Gangrene* were noted. They were in men above 90.

The severe forms of *Malignant Disease* are rare. One man, above 80, had rapidly advancing sarcoma of the shoulder; 5 women, between 80 and 90, had cancer of the breast; 5 men and 1 woman had epithelioma; and 1 man and 1 woman had rodent ulcer. None of these maladies are mentioned in the men or women above 90. Still, although the very aged appear to be less liable to some of the more severe diseases, such as cancers and diseases of the urinary organs, they are, on the whole, rather more liable to the ordinary maladies, the proportion of those above 90 who were altogether exempt from malady being 34 per cent., while the proportion of those between 80 and 90 was 43 per cent.

With regard to the *Eyes*, 8 per cent. are stated to suffer from cataract, 80 per cent. are said to have good sight, although 83 per cent. use glasses. Some have used glasses for many years, which is confirmatory of what I said in the account of the centenarians, that "the occurrence of presbyopia does not seem to be associated with, or to be a prelude to, inconvenience or impairment of sight beyond that which may be corrected by glasses."

The more frequent failure of the organ of *Hearing*, which is noted in more than one-half (56 per cent.) of the returns, is probably due in great measure to the liability to impairment of the delicate mechanism of the middle ear—the tympanum with its membrana tympani, its ossicles with their joints, its muscles, its Eustachian tube, and its lining membrane—in consequence of colds, shocks, and a variety of causes. But in comparing the organ of hearing with that of sight, in this respect, we must not forget that the lessening of elasticity and muscular activity—which we must assume to induce defects in hearing in old persons corresponding with the visual defects classed under the term presbyopia—does not, like the latter, admit of alleviation by an early applied physical apparatus. At least, nothing corresponding to the portable and convenient lenses for presbyopia has yet been adapted to meet the auditory defects which may be attributed to a presbyotic condition.

In 4 per cent. only is the *Digestion* said to have been bad. In 71 per cent. it is reported as good, and in the remainder moderate. Very few were troubled with constipation. In 62 per cent. the appetite

is reported to be good; and by far the greater number are stated to be good sleepers.

I am continually seeing and hearing of instances confirmatory of the inference as to the reparative powers of the aged after fractures, wounds, and ulcers, which were based upon the returns furnished in reply to Collective Investigation inquiries, and which I have already published (*JOURNAL* of July 12th, 1884). These inferences are so contrary to preconceived notions, indeed, to probabilities, that it takes some time and effort and frequent repetition to obtain for them a fair measure of acceptance; but I think the reparative powers of age are becoming more accredited, and that we shall ere long cease to have age adduced as a reason against the hopeful, and therefore careful, treatment of fractures, wounds, and sores in the octogenarian, the nonagenarian, and even in the centenarian.

What is even more remarkable than the healing powers of the aged after local lesions are the reparative powers evinced by them after illnesses, as shown by numerous examples of those between 80 and 100, and also by some of the centenarians, which have been already published (*JOURNAL* of December 11th, 1886). Indeed, the recoveries from severe attacks of bronchitis, pneumonia, apoplexy, and paralysis indicate the reparative powers after illness as well as after accident to be among the most interesting of the senile features. It is certainly strange that, when the other nutritive forces are failing—wearing out, as it were—those which are concerned in the work of repair, which may be regarded as, next to development, the highest effort of nutrition, should hold their ground so well. I have on former occasions (*JOURNAL* July 12th, 1884, and May 9th, 1885) instanced some other conditions in which the same contrast is observed, notably that of the healing of the stump after separation of a part following gangraena senilis, where the structures next to those which were unable to maintain their vitality at all often evince so much granulating and cicatrising energy. As an illustration of this, I have at the present time, in Addenbrooke's Hospital, a man, aged 77, with calcified arteries, in whom the right great toe and the left second toe have mortified and separated, and the parts left have healed well and soundly, the head of the metatarsal bone of the hallux being covered by a large cicatrix, which must have formed with difficulty at any period of life; and cicatrization is now going on rapidly on the surface left by sloughing and ulceration on the inner side of the left great toe. Attention has quite recently been drawn by Dr. Harley (see *Lancet* of June 18th) to certain facts which seem to have a bearing upon this point.

He observes that high breeding in most animals conduces to a marked diminution in the bodily recuperative capacity; also that the higher bodily recuperative capacity shown to be possessed by all men living in a rude state, whether in the form of savages or in the gipsy or tramp wanderer among ourselves, arises from the fact that the refining influences of civilisation materially diminish the animal recuperative capacity. We are familiar also with the great reparative powers exhibited in some of the lower animal forms as compared with those in the higher animals. It would seem that the greater sensitiveness—that is, irritability or susceptibility of the nervous system and of the tissues generally—which is associated with higher organisation, where we may suppose the balances of nutrition to be most delicately swung, are, in a measure, unfavourable to reparative work. We can quite conceive that the calm, quiet processes upon which it depends are less likely to proceed in an orderly and uninterrupted manner under conditions of high excitability, where stimulus easily engenders disorder, than under lower vitality and less susceptible circumstances. Herein, possibly—namely, in the lower and slower excitability of their tissues—may be found an explanation of those recuperative powers of the aged to which I have referred, and of which it is practically important that we should take due account.

ON THE OBSERVATION OF THE PUPIL AS A GUIDE IN THE ADMINISTRATION OF CHLOROFORM.¹

By HENRY J. NEILSON, M.B.

IN the study of the employment of anæsthetics in surgery, the changes occurring in the size of the pupil have not, I think, received the attention they deserve. The decided variations which take place in that organ are very remarkable, yet no definite conclusion has been arrived at as regards their relation to the different stages of anæsthesia. In the chapters on anæsthetics in the leading surgical textbooks, the pupillary phenomena are quite passed over, or are dismissed with a few words.

¹ Abstract of Thesis for the degree of M.D. presented to the University of Glasgow.

Attention was called to this subject in 1874-75, by several articles which were published in the Parisian scientific journals. The most important of these appeared in the *Archives de Physiologie Normale et Pathologique*, and was entitled "Recherches Cliniques et Expérimentales sur l'état de la Pupille Pendant l'Anesthésie Chirurgicale produite par le Chloroforme," par MM. Budin et Coyne. In this paper it was asserted that the condition of the pupil offered a reliable evidence of the degree of anaesthesia produced by chloroform, and was therefore of value as a guide in its administration. This was disputed and contradicted by Professor Schiff, of Florence, and others, who published quite opposite results, and up to the present date the action of the pupil during chloroform anaesthesia is still undecided, if one can judge by the conflicting statements made by the various authors who have investigated the subject.

It has always been difficult for me to determine the exact moment at which a patient is sufficiently under the influence of chloroform for an operation to be proceeded with. The sign of abolition of conjunctival reflex action, which is usually relied on, is very variable; in fact, in the majority of cases it is altogether misleading. I have also frequently experienced discomfort from the want of a reliable symptom to indicate whether the patient is deeply under the influence of chloroform, a matter of paramount importance for satisfactory administration. And I have never been able to observe the modifications of the pupil during the different stages of anaesthesia which are described in many works; namely, that it is at first contracted, then dilated.

From a number of clinical observations made by me in the Glasgow Royal Infirmary, followed up by a series of experiments on dogs performed in the laboratory of the University of Vienna, I am convinced that the statements made in the above quoted French article are for the most part correct. I have formulated the following conclusions:—

1. The effect produced by chloroform on the pupil is at first dilatation, varying in degree and duration, then contraction as the narcosis becomes profound, and dilatation again when the sensibility is returning. If the administration be still continued, with the pupil strongly contracted and motionless, the pupil will also dilate, but in this case more suddenly and completely, and will be coincident with a state from which it will be difficult or impossible to resuscitate the patient. This latter is the dilatation of asphyxia.

2. So long as the pupil dilates in response to excitation by pinching, etc., the patient is not sufficiently narcotised for the operation to be proceeded with, unless the latter is slight and does not require complete anaesthesia.

3. When the pupil becomes strongly contracted and immobile, no more chloroform should be given until it begins to dilate again. If, then, further anaesthesia be required, a little more chloroform should be given till the pupil again contracts.

4. The occurrence of sickness causes dilatation similar to, but more sudden than, that which happens when sensibility is returning, and the efforts of vomiting have the effect of arousing the patient.

The watching of the respiration and the pulse, which are doubtless the best indications of the effect produced on the individual by chloroform, and, therefore, of vital importance for safe administration, does not in many cases furnish evidence of the state of sensibility, in regard to which I hold the observation of the pupil to be of greatest assistance. The sign usually relied on, namely, the insensibility of the conjunctiva, is by no means a satisfactory test, for in many cases conjunctival anaesthesia is established long before the patient can be said to be under the influence of the drug. By observing the pupil, the administrator of chloroform can tell at once when the effect of the drug is on the wane, because the pupil then begins to dilate slowly. Noticing this, he can, by the administration of a few drops more chloroform till the pupil contracts again, prevent the occurrence of struggling and interruption of the operation. In this way he can keep the patient in the state most suitable for the satisfactory performance of the operation without narcotising him more than is necessary. The amount of chloroform required to maintain a state of anaesthesia is much less than that required to put a patient under its influence several times, and, as it is admittedly a dangerous drug, the less administered the better, especially in operations of long duration. And by allowing the patient partially to recover, one runs the risk of the occurrence of sickness and vomiting, which is always an awkward, and often a dangerous, accident. In the absence of such a guide as the observation of the pupil, the chloroform is likely to be given in a rather haphazard way, dosing the patient till narcosis is profound, perhaps too much so, then interrupting the operation till the danger is averted by arousing him, or waiting until signs of feeling, such as struggles or a cry of pain, give indication for more chloroform.

The observation of the pupil also furnishes a fair indication of the

effect produced by chloroform, its size bearing a constant relation to the state of the blood-pressure. In the experiments on dogs the blood-pressure in the carotid artery was recorded on charts, and it was found that contraction only occurred when the pressure had fallen considerably, and, on removal of the chloroform, dilatation only took place when the pressure had risen to a certain height. As reduction of the blood-pressure was pronounced by the Committee of the British Medical Association to be one of the chief dangers in chloroform-administration, the presence of a sign by which the occurrence of that important condition can be recognised must be of practical value.

It is not the purpose of this article to undervalue in the smallest degree the indications afforded by the respiration and circulation in the administration of anaesthetics, but rather to supplement these by a sign which can easily be observed in conjunction with them. The observation of the lips, which is a most convenient method of watching both respiration and circulation, can be attended to at the same time as the state of the pupil. Therefore, while I consider that attention to the former is of first importance, I at the same time believe the latter to be of valuable assistance, and worthy of observation by every one who administers chloroform.

REPORT ON THE PHYSIOLOGICAL ACTION OF COLCHICUM ON THE KIDNEYS OF THE GOUTY AND RHEUMATIC.

By C. S. TAYLOR, M.D.Ch., B.Sc.

(From the Physiological Laboratory, Brussels.)

THE object of research was to determine the exact share taken by the kidneys by assisting in the elimination of morbid matter, and more in especial in promoting the elimination of excrementitious matter through the kidneys. Experiment shows thereby that as the patient, who has been taking colchicum is getting better, the urine becomes increased, either in quantity or specific gravity, or in both. Sometimes there has been a copious deposit of lateritious sediment, and this seems to me to be the most favourable case, but is not essential, for in other instances the excrementitious matter is eliminated in the form of dissolved urea, and then there is no deposit. This, I believe, is the true mode in which colchicum cures rheumatism and gout, and it also explains why it acts most favourably when it does not disorder the bowels. N.B.—After pain and inflammation has subsided, it becomes necessary to continue the colchicum for a week or ten days to get rid of the gouty and rheumatic matter from the system. To obtain its necessary efficacy it should be combined with a mild tonic, and afterwards iodide of potassium should be substituted, and the patient's diet regulated.

Important Test.—Of those taking colchicum, the result was nearly doubled in the space of twelve days. In one case the urine before taking colchicum contained 0.069 per mille of uric acid; four days after commencing to take the colchicum the proportion was 0.076; on the eighth day it was 0.091; and on the twelfth day it was 0.102. In other instances similar results were obtained; for example, in a sailor under treatment for secondary syphilis, etc. In order to ascertain the physiological action of that agent on the kidneys, I first examined the urine. The density was 1025; it contained no deposit, nor was it affected by heat or nitric acid. It contained—

Total solids	...	...	27.5000
Water	...	...	972.5000
Urea	...	...	12.360
Uric acid	...	...	0.281
Inorganic salts	...	...	7.438
Organic matter	...	...	7.423

Total ... 1000.000

N.B.—Here it will be perceived that both the urea and uric acid were slightly deficient if we compare it with the standard of healthy urine as given by Becquerel—

Total solids	...	...	31.185
Water	...	...	968.815
Urea	...	...	13.838
Uric acid	...	...	0.391
Inorganic salts	...	...	7.695
Organic matter	...	...	9.261

Total ... 1000.000

On the third day after the patient commenced to take colchicum