Thesis
for the degree of M. D. Edin.
(old regulations)
by
Migraine
Periodical Headache

Aetiology, Symptoms and Treatment
with some cases.

James Lee, M.B. C.M., 1876.
There is probably no functional disease which presents a greater puzzle to the pathologist than the very common complaint known as Migraine or Sick headache: there are certainly few which incapacitate their victims so frequently or so completely. Nevertheless, the affection is commonly regarded, and often even by our own profession, as a trifling inconvenience, and little attention paid to it, until the habits of life and occupation of the patient are so formed and necessary that it is impossible to change them. In many cases the affection is a most formidable one, interfering disastrously with a man's career and success, operating, as it does, with greatest intensity.
hi his best working years. If die-
ished at puberty, or sooner, as may
frequently be done, this same conviced, the
duty of the medical men to urge on
parents the adoption for their child of an
open air life instead of an indoor
sedentary one, to which unfortunately
the temperament of migraneous patients
leans. Many who only experience the
milder forms of the malady are able
to enjoy their lives and work, with but
slight inconvenience, but the victims of
frequent and severe hemieranice headache
have their capacity for work and
enjoyment immensely curtailed. In
point of fact, where the victim is a man,
he is handicapped to quite as great an
extent as a woman by severe hemicrania.
In the case of professional men few functional troubles are more damaging, and in the severer cases the aphasia and other sensory disturbances may, and have had, an even obvious interrelation set on them by the sufferer. A medical friend of mine had this experience and Living relates a similar case. Certain it is that the attacks usually continue till middle life is reached, and the prediction that they will then decline or cease, is not infrequently fulfilled, especially when the strain of life and habits remain the same as in early manhood. Treatment, which often acts like a charm in the milder cases, in the more severe is generally useless or actually harmful.

So that it seems advisable, when one sees at puberty or thereafter a well-marked case of migraine, to recommend the avoidance of a sedentary life, and, so far as is possible, the adoption of measures which will raise the digestive and nervous systems to their highest pitch. By this means too it may be possible to avoid handing down this wretched ailment to future generations. Strange though it be, this disease seems to carry with it a certain "cachet de noblesse." Regarding other maladies which afflict them, for the most part, people are silent, but the victim of nervous headaches does not hesitate to refer this infirmity or actually boast of it. "Kovalevsky" in his recent book 'La Migraine et son traitement.' p. 21 Paris 1902.
has an amusing passage. He said, "On envisageait autrefois la migraine comme une maladie noble, propre exclusivement aux classes privilégiées. Il faut avouer, que si l'on envisage cette maladie comme le privilège d'une certaine classe, cela n'est pas un que l'on puisse lui accorder. Cependant je me rappelle le temps où les femmes nerveuses des classes moyennes de la société faisaient parade de la migraine, comme d'une preuve de la délicatesse de leur nature. Ensuite la migraine s'étend, jusqu'aux classes moyennes, et il s'y trouva un grand nombre de personnes souffrant de la migraine. Quelque temps se passa encore, et l'on découvrit la migraine, chez les paysans, chez les femmes de chambre, les cuisinières, les artisans, etc."
La mégalanie se démocratisait les classes moyennes ne s'en vantent plus, mais se sentent cependant choquées que le peuple se permette d'en souffrir aussi. However, that may be, it is still regarded I think, as "vapeur de joli femme" or "mal de bel esprit" by its victims; pathologists are more inclined to regard it as a sign of Degeneration, but since many distinguished men e.g. Siry the astronome, Charcot, Du Bois Reymond, and even it is said Napoleon I, have suffered from Mégalanie, one may well feel content to be degenerate in Sude Company.
The literature of the subject is somewhat extensive considering how definite are the typical symptoms. It is chiefly interesting from the ingenious theories that have been propounded to account for the remarkable sensory phenomena. It was known to the older writers, Galen, Caelius Aurelianus, Alexander Trallians. French authors have devoted a good deal of attention to the subject and, until Lucé’s work appeared, there were no English authors at all comparable to Trélat, Poirier, Pelletan, Labarraque, Calmeil. In spite of this fact, however, the French authors, while accurately observing the symptoms of the disease, have been singularly barren of theories to account for it, most of the latter being of French.

I. Pelletan, de la migraine et de ses divers traitemens
2ème 28ème 1843 p. 12.
English or German origin. Tiélot seems to have regarded it as a purely stomach affection. Pelletan, ten years later, thought it was neuralgia arising from various reflex causes, especially in connection with the eyes, the uterus or the stomach. The first to assign the cerebrum as the seat of the disease were Romberg who called it a "neuralgia cérébrale", distinguishing it sharply from peripheral Neuralgia. Duf Bois-Reymond, himself a sufferer from migraine, was the first who tried to give a physiological explanation of the sensory symptoms. He was followed by Mollendorf and Euleberg.

The standard work in English is that of Living published in 1873. Lately

1. *Tract de Nerfs*, quotes by living p. 236–8
2. Pelletan - de la migraine et de ses div: trait. 2 "ed 1843.
Haig and Rachford have published theories differing entirely from the older views. These theories as to the nature of the disease may be considered as falling into four groups. 1. Practically until the time of Du Bois Reymond, it was regarded as a neuralgia of the fifth nerve, caused by various peripheral irritations e.g. uterine, gastric, ophthalmic, Poiry, Pillet, Labarraque, Tinel et. 2. The sensory nerve-storm hypothesis of Living and Hughlings Jackson. 3. The toxic theories of Haig and Rachford.

II. Medical News, May 26th, Nov. 8th. 1894.
III. Poiry - Memoire sur la migraine 1831.
IV. Labarraque - Essai sur la cephalalgie et la migraine, Thèse 1837.
who assume that Migraine is due to a chemical poison exerting a special predilection for certain parts of the cerebrum. Probably no one has died of Migraine so that its pathological anatomy is not, but these theories, while mostly, no doubt, erroneous, have contributed in no small degree towards a rational treatment of the disease, and possibly some of the latter ones may yet resolve themselves into facts.

The first view, that Migraine is a Trigeminal Neuralgia, has its supporters still. Pickler says, it is evident that there is a strong relationship between Migraine and Neuralgia of the Trigeminal

nerve, and if we study the symptoms of the two conditions and consider the causes which produce attacks of each, we cannot but arrive at the conclusion that migraine is a variety of the ophthalmic division of the fifth. Further, that migraine in early life may become later a pure neuralgia. Anote speaks of it as "an inherited imperfect organization of the larger or smaller tracts in the medulla causing atrophic molecular irritation in the root of the trigemines." He himself, in early life had typical migraine, while later his attacks were pure neuralgia. Allied 2 topics support this view. But the
objections to this theory are strong. It is true that certain cases of migraines
lead in later years to assume more and more the character of neuralgia. But
such cases are probably mere coincidences. The character of the pain is totally
different in the two affections. In the
case of an inflamed supra orbital nerve
pressure over the painful site increases
the pain. In migraines there are as a
rule no painful points, and pressure
does not affect the pain. Neuralgias
and paroxysmal
are piercing, darting in character: the
pain in migraines is dull, steady
and progressive. People who suffer
from both complaints readily distin-
guish between the different characters
of the pain.
The neuro motor theory was propounded by Dr. Bois Reynard, who drew his influence from his personal symptoms. He assumed that, in his own case at any rate, the inquisitive was due to a unilateral tetanus of the vessels of the head in the district supplied by the sympathetic cervical. He suggested that this form should be called Hemorania Sympathico-Tonica. A few years later, Malleendorf suggested that the true cause was the converse, viz. a unilateral relaxation of these vessels. Eulenburg tried to reconcile these opposing views by assuming that the two forms, the Sympathico-Tonic and the Angio-

Paralytic occurs in each attack, the dilatation of the vessels following as a natural consequence on the tonic contraction. That, when only the angio-paralytic form is exhibited, the reason is that the tonic stage is so short as not to attract attention, the dilatation of the vessels following rapidly in the short stage of contraction.

In the tonic form, at the height of the attack, the face is pale, the eye sunken, the pupil dilated, the temporal artery hard and cord-like, and the ear on the affected side pale and cold. Eulenburg says, the temperature in the internal auditory meatus may fall 0.4° to 0.6° C., and that pressure on the Carotid artery of the
affected side increases the pain. In the angio-spasmodic stage of rarity, the picture is reversed. The face is red hot and turgid, the conjunctiva injected, the pupil contracted, the ear red and hot, and the temperature in the external auditory meatus increased 0.2 to 0.4°C; the secretion of sweat is increased, the temporal artery enlarged, and compression of the carotid on the affected side eases the pain, while compression on the opposite side increases it. Eulenburg further says that irritation of the cervical sympathetic produces symptoms corresponding to the tonic form, while paralysis, as by section, produces symptoms analogous to the paralytic.
form (Claude Bernard's experiments). That the dilatation of the pupil may be accounted for by the excitation of the Dilator fibers arising from the Celiac Spinal center and following the course of the cervical sympathetic. That local tenderness can be elicited during and sometimes between the attacks in the region of the upper cervical ganglion and spinal processes of the lower cervical and upper dorsal vertebrae, corresponding to the Celiac-Spinal region of the cord. That, the retardation of the pulse and increase in the salivary secretion sometimes occurring, point to sympathetic involvement. Landen I. Brunton tried to explain the discrepancies in his neuro-motor theory by suggesting

that contraction and dilatation exist at the same time at different points of the same artery. "The consequence of this disturbance being, that the blood instead of being gradually regulated in its onward flow by the gentle action of a long artery, is suddenly checked by a local contraction, and the successive impulses produced by the jet of blood hammering upon this constricted point give rise to great pain." This engrossing vasomotor theory seems to have been widely accepted, e.g. by Vermel, Hammond, Wilks, MacLenzie. But such clear-cut clinical picture as those described by the advocates of this theory must be comparatively rare.

1. Traité Pratique de Médecine. Tome III p. 604
2. Diseases of the Nervous System. p. 690
I have never seen a case where the contraction or dilatation of the pupil was marked, nor where the patient had experienced what must be a distinct subjective symptom, viz: the change from the auro-spastic to the auro-paralytic stage. Nor does the theory account for the aphasia and hemianopsia. Living says: "I have myself repeatedly watched the severest paroxysms of typical medicine without being able to detect any of these indications of hyperaemia to which Dr. Möllendorf refers; cases in fact where there has been no apparent dilatation or objective throbbing of the vessels, no conjunctival redness, no contraction of the pupil. I have also carefully exam-
I Living. p. 315.
ined the fundus of the eye with the
ophthalmoscope in a severe hemiconvulsional
case, where the visual phenomena were
highly developed, and where, if at all,
we should certainly have expected to
find the appearances Dr. Möllendorff
describes; yet I have been unable to
discover any distinct difference in the
vascular condition of the choroid, optic
disk, or retinal vessels on the two sides,
or any striking departure from the
appearance of the same parts in
health, and certainly no evidence of
hyperemia. I am far from saying
that the megrim paroxysm is never
attended by such a disorder as Dr.
Möllendorff describes, but I am sure that
it is often, and I suspect very generally,
absent; and, this being the case, it is impossible to regard it as an essential condition of the paroxysm, or a principal cause of the symptoms.

Novakovsky says: "Mais si même l'explication d'Eilenburg répondait à toutes les conditions, nous ne pouvons pas la trouver satisfaisante, car elle se rapporte à des cas, décrits dans des livres, et non à des cas que nous rencontrons dans la vie. Les cas classiques de migraine spastique et paralytique ne font qu'une toute petite partie des cas qui existent, et font plutôt exception de la règle générale; la grande masse des cas ordinaires de la migraine offre une telle combinaison des deux formes de la migraine, que ni..."
l'une ni l'autre des deux théories n'est en état de les expliquer.

Indeed these theories seem to be merely to restate the clinical symptoms rather than to explain the cause of them.

The third explanation of the nature of migraine - the "vemec-storm" theory - is associated with the names of Living and Hughlings Jackson. Living regards the affection as essentially an idiopathic neurosis closely allied to epilepsy, and interchangeable with asthma, mastalgia and angina pectoris. He says, "On this theory then the fundamental cause of all the neuroses is to be found, not in any irritation of the viscerum or cutaneous periphery, nor in any disorder 1. Living p. 336."
or irregularity of the circulation, but in a primary and often hereditary vice, or morbid disposition of the nervous system itself; this consists in a tendency on the part of the nervous centres to the irregular accumulation and discharge of nerve force - to disturbed and uncoordinated action, in fact; and the concentration of this tendency in particular localities or about particular foci, will mainly determine the character of the neurosis in question. The immediate antecedent of an attack is a condition of unstable equilibrium and gradually accumulating tension in the parts of the nervous system more immediately concerned, while the paroxysm itself may be likened to a storm, by which
this condition is dispersed and equilibrium restored. In support of his theory he adduces the facts: 1. That in acute diseases, migraine, epilepsy, asthma, the symptoms are paroxysmal and in many cases truly explosive in character. 2. That they are intermittent, tending to recur at approximately regular intervals with healthy intervals. 3. The impurity which while a sufferer may expose himself to various influences, for a certain period after a cessation, which at another time would infallibly have occasioned an attack. 4. That the exciting causes are so varied in character as to render their operation only intelligible on some such notion as that of a gradually increasing instability.
of equilibrium in the nervous system. He also supports and illustrates his theory by the analogy of various healthy nervous actions which seem to partake of the character of "Nervous Storms", viz: the act of sneezing, the gradual accumulation and dispersion of a natural appetite, and the development of a mental emotion or fit of passion.

Hughlings Jackson speaks of migraine as a sensory epilepsy, the discharging brain being situated in the posterior lobes of the cerebrum, or such parts of them as are developed out of the optic thalamus. He thinks migraine bears the same relation to hemianesthesia with hemianopsia from disease of the optic thalamus, as a unilaterally beginning convulsion does to the

ordinary kind of hemiplegia from dissection of the Corpus Striatum.

This doctrine of sensory nerve discharges is excellent as a theory, pure and simple, and it has this advantage over the vaso-motor theories, in that the advocates of the latter were obliged to assume, in addition to the circulatory disorders, some kind of morbid irritability in the nervous system, as a cause of the disordered circulation. But, while it is an adequate explanation of the symptoms, it is utterly lacking in proof. Nor does it take us much further etiologically, offering as it does no cause for these nerve explosions, the explanation of which may possibly yet be found by the method of investigation next to be considered.
The fourth theory concerning the nature of migraine may be called the Toxic Theory. Its chief advocate is Haig himself a sufferer from migraine and in despair of obtaining any complete relief from drugs he abandoned butcher meat, replacing it by milk and fish with complete relief from his headaches. Thinking that the clinical history of migraine brought out a strong relationship between, he began to suspect that uric acid might be the cause in both cases. He found that when he separated the urine excreted during the headache from that both before and after it, a definite and distinct relationship between the headache and the excretion of uric acid at once became apparent. After having noticed the relation of the headache to I. Uric Acid in Cauvation of Disease. 2nd ed. 1894 p. 3.
the excretion of uric acid, he soon noticed that each of its concomitant symptoms bore exactly the same relation to uric acid that, when the pulse was slow and of high tension, there was always a greater excretion of uric acid than when it presented the opposite character, and that with the mental depression and scanty urine."

He then found that he could produce an intentional headache. ... that when I produced an increased excretion with alkali, I produced the headache, mental depression, cold surface, slow pulse and scanty urine, and that, when I stopped the pulse excretion with an acid, I removed all these symptoms; so that not only had I acquired the power to relax or contract the arteries, but I had also the power...
to relax or contract the arterioles and capillaries, to affect the tension of the pulse, the rate of the heart's action, and thus influence the circulation in the brain, skin, and kidneys, and probably the whole body."

He then went on to investigate the action of various drugs on the excretion of uric acid and found that all substances which increase the solubility of uric acid increase its excretion and clear it out of the body, while, conversely, all substances which diminish its solubility diminish its excretion and tend to produce its retention in the body and accumulation in various organs and tissues." Further, he says... as side issues, I have been led to reason on the pathology of epilepsy.

I. Haig, p. 17. "Uric acid in Causation of Disease 2nd Ed."

II. 12. p. 4.
in some cases of which I found exactly similar fluctuations in the secretion of uric acid to those met with in migraine, thus explaining a clinical relationship between these two diseases which had long been known and written about—also on the pathology of rheumatism and rheumatoid disease, the causation of Bright's disease, Raynaud's disease, and paroxysmal haemoglobinuria and anaemia. As regards the causation of the headache, the effect which, as we shall see presently, uric acid exerts on all the vessels of the body, is closely allied to that which occurring locally, has been supposed to be the cause of the pain... irritation of the motor nerves in the region of I. Haig p. 123. Uric Acid in Causation of Headache 2-39.
the cervical sympathetic...... I think however that the effects of uric acid on contracting the peripheral vessels and producing high arterial tension, and the further effects of this high arterial tension on the extracranial circulation will give us a much better explanation of the causation of the headache than any more or less hypothetical irritation of the cervical sympathetic. That uricacidemia should produce in certain people migraine and not epilepsy or arthritis, he thinks due to the probability "that certain parts (of the brain) possibly owing to local conditions of anatomy, function, or nutrition are specially affected and give rise to special symptoms." As E. Hag p 126. 2nd edition. Uric acid in causation of disease p 127.
regards migraine. I have suggested that
that the prosecution of large arteries of
supply may render some more liable
than others to suffer from the intra-
cranial effects of high arterial tension:
this in fact accounting for the fact
that migraine is more common among
those who work with their brains than
among those who work with their
muscles.

Dr. Rachford of Cincinnati has made
some inquiries in the same direction.
He confirms the results obtained by Haight
regarding the increased excretion of uric
compounds during attacks of migraine,
and, in addition, finds there is then
a decided increase of paranuatic
in the urine. In normal urine
Medical News, May 26th, 1894. quoted by
he finds it present in almost in-
finiteimall amount, but in migraine
it and the other leucamines of the
"Lanthin" group are discovered in
relatively large amounts. In one
case he obtained a cubic centimetre
from urine voided during a migrainous
attack, whereas he found that one
litre of healthy urine only contains
one milligramme of paraxanthin.
Following up these researches during
the next three years he says that in
more than 50 migraine patients he
has rarely failed to find a great excess
of paraxanthin in the urine, even
when only small quantities of urine
were available. Also that it was not
excreted by these people at any other
time than during an attack. Its toxic effect on the nervous system he proved by injecting a small quantity into the peritoneal cavity of a mouse. He found it only in a small proportion of epileptics after an attack. He reasons his belief that paranautum is an essential factor in the production of migraine.

Whether one or other of these theories is true remains to be seen. It is doubtful whether all cases of migraine show the high tension pulse which is an important part of Haid's theory. Still these investigations are a great advance on the vagomotor and nerve storm theories.

Evidence has long been accumulating that migraine and arthritis are in

Jackson - Lancet 1875 Vol II p.51
I Lvieing p.397 - Trous, Lancet 1896 Vol IV p.376
Migraine et Arthritisme, Scalz, Therapie de Paris, 1887, p.84.
Alburt - Medical Times & Gazette 1886 Vol I p.245
some way allied. A recent authority says migraine bears a close relation to gout, where the uric-acidaemia is only a symptom of the disease and not the cause. That it is a toxaemia, the nature of which is likely to be found in the investigation of the blood before, during, and after the paroxysms. That the liver and digestive are important elements in the causation. "If from any cause the power of the intestine to resist invasion by toxins formed by bacteria in the alimentary canal, but not under normal circumstances absorbed, be lowered, an absorption of these toxic substances may occur, and this absorption may initiate a disturbance in that part of the patient's..."
system which has naturally a low resisting power."
Factors which act as Predisposing and Exciting Causes of Migraine.

1. Heredity. Migraine is probably transmitted from parents or ancestors to children more constantly than almost any other disease. In 20 cases which I have investigated, I have found a definite migrainous history in 13. Living found it in half his cases. Kovalcosky in 70 out of 110. Vermel says it is the most important predisposing cause. Eulenburg says it is as well established as in Epilepsy, insanity, and Hysteria. Pelletan observes the same thing.

Eulenburg claims it follows most frequently in the female line. This is denied.

Living p. 28

2. Kovalcosky, de la Migraine, 8eme Traitement p. 11.
5. De la Migraine et de ses divers Traitement 2me Éd. 1873 p. 68.
by other writers but since women are probably more frequent victims than men it is naturally of ten most transmitted from the mother. French writers term this direct transmission of a similar disease l'héridité similaire. By l'héridité hétérogène, they designate migrainous cases which seem to owe their origin to parents of neurotic gouty or rheumatic diathesis. In this connection must be mentioned Epilepsy, which most of the older writers regarded as being closely connected with migraine. Hirtz² says they are closely allied. Eulenburg³ says they often alternate in the same family. Fére⁴ out of 308 Epileptics found that migraine existed in the father.


4. Quoted by Kovalevsky p. 12, op. cit.
in 88 cases and in the mothers in 116 cases. Suckling says it is closely allied to epilepsy, that the subjects of migraine are liable to epileptic attacks which replace the attacks of migraine; that the epilepsy of migraine is usually curable but the headaches become more severe when the epilepsy is cured. Suckling says this is doubtless the particular neurosis which exhibits the closest connection with migraine.

My own experience would lead me to believe that the relationship is not too close. I have only found a definite history of epilepsy in 3 cases out of 20. Wood and Fitz think that is in the highest degree improbable that any relationship

2. Suckling p. 205.
Exists. Hammond is of the same opinion. Wilks argues similarly, and affirms from his experience that migraine patients never become epileptic or belong to epileptic families. In a word, he says, "I see no resemblance between an attack of migraine and epilepsy. I observe they never pass into one into the other, they do not occur in the same families or the same class of persons and the remedies which relieve the two diseases are different."

No doubt epileptics are frequent sufferers from headache but I do not think there is adequate proof that migraineous subjects tend to become epileptic. It is certain however that in nearly all.

1. Diseases of the Nervous System p. 670
2. Lancet 1888 August 11%
migrainous histories nervous diseases abound. Many other \textit{constitutional}, uterine diseases have been suggested as the parents of migraine, e.g. gout, rheumatism, tuberculosis, Syphilis, but, with the exception of the first two, none of the rest have any claim. Juncius in 1747 said that gout may manifest itself for some time solely as migraine, appearing later as regular gout. This accords remarkably, with the theory of Haig. Wood and Fitz say almost all cases seen in Philadelphia have a distinct gouty history. Suckling says in a large number of cases there is evidence of gout. Druce \textsuperscript{4} says there can be no question as to the frequent connection of

\textsuperscript{1} Quoted by Kovalevsky, op. cit: p. 13. de Migi: 'Istoria ted.'
\textsuperscript{2} Pratt: \textit{Hist. Med.}: 1847 p. 458
\textsuperscript{3} Juncius \textit{loc. cit.}
\textsuperscript{4} Druce \textit{op. cit.}: p. 404.
migrain with a gouty diathesis, and its occasional replacement by fits of regular gout. Kовалевский quotes Charcot and Trouseau as favouring this view, and among his own cases 25 per cent had a gouty history.

2. Sex. Most authors are agreed that women suffer more frequently than men. Pelletan, Hirz, and Vermel say they are more often attacked. Eulenburg says the proportion is 5 women to 1 man. Kовалевский thinks it is about 2½ women to 1 man. Lüenuig says it is about 5 to 14, while Suckling thinks women suffer only a little more frequently, but much more severely than men. It is likely that Lüenuig's figures are most.

Correct. It is probable that in these cases the causes were not equally represented, since women seek advice more readily than men. The most typical cases I have seen have been in men and in them the optical and sensory phenomena have been better represented. However, since the catamonia are a frequent exciting cause, probably men are a majority.

3. Age. Migraine is commonest in the active period of life. It is not uncommon in children before the age of puberty, but young children seldom complain of headache and periodic malaise with occasionally vomiting may be all the subjective signs. Suckling says there is usually fever in such cases. But this occurrence would cast grave doubt on

the diagnosis. Later I will quote some cases of what I believe to be migraine in young children. Most frequently, however, it is manifested at puberty, increasing in violence till about the age of 30-35, and then, in a certain number of cases, becoming less severe and less frequent as age increases. Some often get worse with the menopause. Trotter said if you did not have it before 25 you were immune. This is not absolutely true. I have seen several cases where migraine has appeared after thirty, owing to adverse circumstances, but in such cases the elimination of commencing organic disease has to be carefully made. The more marked the migrainous history the earlier is the disease likely to manifest itself, but I have not found that such

1. quoted by Estabrook, op. cit., p. 6.
2. vide page 113. Cases 16, 17, 18. Dr. Goo's Cases, p. 118.
Cases are more ineriterate there where
the hereditary tendency is less marked.

4. One of the most important factors
amongst those which predispose to migraine
is a sedentary indoor life. It is said that
unregular and automatic mode of life is
beneficial, but I believe migrainous
are more often than not people of fixed habit,
whose lives run in a dull routine. People
accustomed to a reasonable variety of
climate, food, occupation, amusement,
suffer far less frequently, probably
because slight apts do not act as
effecting causes of the malady. If Stait's
theory as to the causation of migraine be
true, the explanation is simple, viz that
unwanted exercise or emotion sets floods
in the blood with excess of uric acid, which
is eliminated by the urine. If however the exercise be continued, since there is probably no increased formation of uric acid, there will soon cease to be an excess in the blood.

5. Social position. Migraine belongs to all grades of life. Kovelovsky says that out of 110 cases 54 belonged to the aristocracy, 30 to the clergy and business men, 8 to the lower middle classes and 16 to the labouring classes. Statistics of this kind however will vary with each observer. Living says a great proportion of cases lie among the working classes.

6. Visceral Defects. With regard to visceral defects as a predisposing cause there is considerable diversity of opinion. Weir.

1. Haig, p. 16, Uric Acid in Causation of Disease, 2nd ed.
2. Kovelovsky, p. 22, La Migraine et son traitement, 1902.
Mitchell was I think the first to call attention to eye defects as a cause of headache. Brunton says between 80 and 90 percent of all headaches are due to this cause, e.g. hypermetropia, myopia, astigmatism, inequality of the focal distance of the two eyes and imperfect converging power. This would practically reduce the treatment of migraine to a correction of abnormalities of vision. Kovalsky does not think it is a frequent cause and Scheckludt out of an enormous number (over 5000) of cases had only met with 2 or 3 which have been benefited by glasses. Brunton quotes several remarkable cases, but I think the frequency of this cause of headache has been

2. Practitioner Feb. 1894 p 102 3
3. op. cit. p 31. La nouvelle et son traitement 1902.
exaggerated in recent years, and, while bearing in mind the necessity of eliminating it, I am clear of holding out any hope of benefit by this means.

7. Migraine, like many other diseases has been included in the indefinite list of nasal reflex neuroses, from polyposis adenoids, but with I think little foundation. For the last decade operations for adenoids have been exceedingly common and, if such a cause for migraine had existed, it would have been well establishe by now. I have not seen a case of the kind.

The exact causes of migraine are very various. The slightest infraction of the rules of health, of fixed habits, overwork
want of sleep, emotion, articles of food, want of food, alcohol, railway journeys, crowded rooms, bright lights, changes of weather, sexual excitement, in short, circumstances of all kinds, in themselves the most commonplace, are sufficient to excite in a migraineous subject an attack of his malady. Kovalewsky mentions the case of a lady who had an attack every time she touched a piece of satin, and Labarrague that of a medical man who was similarly affected by an autopsy. I have a patient who is attacked every time he is foolish enough to eat salmon. The most common causes in my experience are railway journeys, theatre-going, fatigue bodily or mental.

1. op.cit. p.32. La Migraine son traitement 1902
2. quoted by Henry : p. 7506. Dict. de méd. et de chir. 1876 vol. 3 ECL.
Clinical features of Migraine.

The symptoms of migraine vary both in severity and in character. Hitzig well describes this peculiarity. "Véritable Prétor dans ses manifestations, modifiant ses allures d'un malade à un autre...... la migraine comme l'hystérie ne se prête que difficilement à la description d'un type classique. ...... On peut dire que chacun a, pour ainsi dire, sa migraine, presque constante pour chaque individu, mais fort différente dans la généralité. ...... tandis que, pour les uns, l'accès détermine un accablement et une prostration qui mettent le malade impuissant sur son lit, il n'est que, pour les autres, qu'une sens-ation raide, soit de douleur cérébrale,
Soit de nausées, soit de somnolence, qui n’empêche pas le travail quotidien.
Many attempts have been made to classify the different varieties. E.g.
Idiopathic and Symptomatic. Hughlings Jackson divided it into 3 varieties.
Typical, subtypical and infra typical, according to severity. French writers
describe many forms. E.g. la migraine, simple, ophtalmique, névrose, ophtalmomoplegique.
There does not seem to be any advantage in such subdivisions, which only tend to complicate the subject. The simplest method of describing the disease is, I think, to regard the form known as ophtalmic migraine as the typical form.

1. Compendium de med.: 1st. artículo migraine 1845.
2. Kovalevsky, p. 34. la migraine dano traitement.
and the other varieties as complicated or abortive types.

Attacks occur as a rule with but little regularity, every week or fortnight or month or year. There are exceptions however. Some women have attacks regularly at the catamenial period and at no other time. Pelletan mentions the case of a monk who was attacked every Monday. Smilker quoted 6 cases in which attacks came on on the same day regularly, with a definite cause in some cases, in others not. Some people too have attacks on Monday, often I think, the result of over-eating on Sunday. Lüising says that in a considerable number

1 Pelletan. De la Migraine 2nd Ed. p. 52.
2 Medical News 1887 July 19th.
3 Lüising p. 39.
of cases there is a certain kind of periodicity, not exact like that of
ague but only approximate. This is only what one would expect, since
the exciting causes are so various and for the most part accidental in
character. In this connection Linning
had a remark, the truth of which I can
vouch for from my own experience, viz:
that the more serene the seizure, the
greater the immunity which precedes
or follows it.

Prodromal symptoms of various
kinds have been described. Suckler
has three remarkable cases. One, a
woman who used to see two of her
children at her right side before an attack.
Linney p. 39.

Another, who used once a large and hairy dog, and a third a green snake. Lening and Kovalovsky give examples of somewhat similar kinds, but I do not think these definite curing are met with in some migraine. However, undoubtedly some people know that their enemy is imminent, but they are seldom able to say why, further than that they have a presentiment or foreboding. Occasionally a sense of depression and indisposition works a vague and groundless sensation of impending disaster, muscae volitantes, or borborygmi occasion the uneasy feeling of an coming attack. On the other hand it is not unusual to find patients who say they know

1 Lening p. 88-90 on migraine + sick headaches
2 Kovalovsky p. 40-44. LaMugnaie 1800 told
they are in danger when they feel particularly well. Quite commonly, however, the attack commences quite suddenly like a bolt from the blue, and in cases where the ocular symptoms are well marked, this is in my experience the rule, that the amaurosis or other visual derangement is the first and most disquieting symptom. White in 1713 is said to have been the first to describe this symptom under the title of partial temporary amaurosis. Perry Wallis, the astronomer Airy, accused from this symptom and have left detailed descriptions of it. Perry in 1881 was the first to make a special study of it, and described it from his

1. Koralevsky p. 69 la migraine &c. traitement
2. d'Enfert p. 9 de la migraine et de la maladie des crises
3. Ibid. p. 10. 11.
4. Quoted by Bellot p. 30, de la migraine 2. iii. 1843.
sensations. Au moment de l'invasion, la vue est moins nette, on éprouve une sensation très analogue à l'éboulement, il semblerait qu'un nuage se manifeste au centre de l'image, qui se peint sur la rétine ; peu à peu le point terre qu'on observait s’étend ; bientôt, et après une ou deux minutes, il se dessine à l’entour de l’espace obstrué un arc de cercle lumineux, colorés chez quelques individus, mais pâle chez les autres, disposés en zig-zag, agité par une sorte d’oscillation continue. D’abord très petite, cette portion de cercle grandit en même temps que le point central obstrué commence à s’éclaircir, et se développant de plus en plus
scintillant continuellement, semblant se rapprocher successivement de la circonférence de l'iris, l'arc lumineux finit par disparaître. Lorsqu'il arrive à l'extrémité du champ de la vision, Parry had previously, qu'eu a very similar description, and Parry's later one only differs in details. The phenomena described by these writers, the fortification spectra, luminous eddying wheels, balls of light, Yeq-Yaq lines and sparkles of various colours are either as I think, comparatively rare, or else the anticipation of suffering that is to follow produces a disinclination to accurate observation. In most cases where Yeq-Yaq fortification spectra I, Dr. Hubert Huy, Juneing p. 82-4.
are very pronounced, any attempt on my own part to observe the phenomena continuously, speedily, intensifies the nausea which is commencing at this time. The commonest description one hears from patients is that of a mist before the eyes, and sometimes a description of the sensation caused by looking at the sun. The latter exactly describes my own case at the beginning, so well indeed, that, when I have inadvertently looked hard at the sun while golfing, I experience the well-known uneasy sensation. Wood-Fitz say the most frequent disorder of sight was amblyopia accompanied by vivid scintillations of light passing zig-zag over the field of vision. Hemiplegia, Either I. Practice of Medicine - Wood-Fitz 1877 p.458
monocular or binocular, sometimes lateral, sometimes vertical, may replace the amblyopia. Or a central scotoma may be the chief phenomena, and rarely these changes of vision change into one another. Kovalevsky says "de toutes les formes de scotomes c'est le scotome ordinaire et le hémis Scotome qui se rencontrent le plus souvent, le scotome central se rencontre plus rarement." Levine says both eyes are always affected, while Kovalevsky declares that, either only one eye is affected, or only one half of the visual field. Probably, as in the case of migraine symptoms generally, there is not much uniformity in this respect.
-omena continue when the eye is closed. Patients, too, are seldom seen in this stage, nor would they be likely to submit themselves to examination if they were. The same difficulty has prevented any reliable ophthalmomicroscopic examination being made. Lying had no opportunity, but could detect no fundal changes. Möllerström says the results of ophthalmomicroscopic examination vary; that in a few cases there is dilatation of the central artery and vein of the retina on the affected side, and dilatation of the choroidal vessels, but that often the conditions are normal. Harris professes to have studied 11 cases of hemi-
anopsia in migraine. He found that the dividing line passed exactly through

1. Myers p. 90 on migraine and such headaches
2. quoted by Schmidt in Memorials Cyclops: 1878 Vol XIV p. 55
3. American Year Book of Med: Spring 1889 article, Migraine.
the fixing points, and did not show the indenture which ordinarily appears in chronic cases; that quadratic defects in the visual field are strongly suggestive of cortical lesion. He attributes the scintillating scotoma in migraine, the fortification spectra to:

to discharge in the half visual centre in the tuncus. Gowers suggests a hypothetical higher visual centre in the region of the angular convolution, which immediately subserves the perception of visual impressions, and that the spectra of migraine and epilepsy may be due to some struggle, or, if the expression may be pardoned, 'harmonious discord between the higher visual centres of the two hemispheres'.

During the persistence of the ocular symp. there is quite clear; at first no headache is felt, but it soon makes its appearance, and as it increases, the ocular symptoms pass off. They usually last about 20 minutes. Sometimes a considerable degree of vertigo is felt, and very commonly nausea, which passes off towards the end of this stage, to commence again later on. It is here too that the peculiar sensation of "faint sovenirs" is sometimes experienced. With regard to the condition of the pupil nothing definite is known. In my own case it remains quite normal. Some cases, which may be called abortive, forms cease at this stage, "the vanishing inheritance of previous generations" (Living p. 61 on migraine and side headache).
This has been occasionally my own experience, more frequently during the last few years, when the attacks have become feebler and less frequent. In some people, but most infrequently, a timely dose of antipyrine and caffeine may produce a similar result. In others again this stage is omitted or so slight as to escape notice. I may remark here, that, when the ocular symptoms are well-marked, as a rule the sensation is an extremely disagreeable one. So much so indeed, that one feels a sense of relief as the headache comes on and the eye symptoms pass off. The headache commences little by little, generally over a very small and definite area usually
supra-orbital or frontal. Gradually increasing it spreads towards the temporal and parietal regions and may involve the opposite side, while yet preserving a maximum of intensity at the spot and side originally attacked. Vernet says a peculiarity of the headache is, that the pain is either all over the head or in one half, the front or the back, or in one quarter, that is half the front or half the back; it rarely is found in the sagittal direction, i.e. in one half of the front and one half of the back. In other words the carotids or the vertebro arteries are affected, or both, not one of each at the same time. The headache of migraine.

(Bernheim et Laurent)
Io a dull boring pain quite un-like the piercing darting character of Neuralgia. The authors of the Compendium describe it as follows: "Il semble à l'un qu'on lui perfore la tête avec une vrille, ou qu'on la lui brise avec un manteau, à l'autre, qu'on y daire ince-\-ment des pointes acérées, ou qu'on exerce des tractions à l'aide de tendilles; celui-ci croit sentir un état qui rapproche l'une de l'autre les régions temporales; celui-là, au contraire, croit que les sutures du crâne sont céder à une force intérieure". I have not noticed Trotot's painful spot but a gen-\-eral cutaneous hyperaesthesia is felt over the painful site and a diffuse form.

Compendium de med. prat. art. le, Mmeecet et Fleury p. 507, 1845. quoted by Hurtz op. cit. p. 507.
Eulenburg says deep pressure over the region corresponding to the upper sympathetic cervical ganglion causes pain, and sometimes also when applied to the spinous processes of the last cervical and first dorsal vertebrae. As a rule, the pain occurs on the same side in each person, but not invariably so, and it may leave one side altogether and take up the other. The frequency with which the different sides are affected is doubtful. Hirtz says the left side is commonest and compares Hystérie, where the motor and sensory symptoms are commonest on the left. Kovalevski in 110 cases found the left side affected in 44, the right in 31.

30, both sides in 32, and the vertex and occiput in 3 cases. As a rule I think the bilateral cases are the more severe. The headache is said to affect the side opposite to that in which the visual disturbances occur. The special senses become hyperaesthetic and bright lights, noises, and smells are abhorrent. Some degree of mental confusion is common. The nausea which had lessened as the visual symptoms passed off begins to increase, and attempts at emesis increase the headache. In some cases vomiting gives relief, but often only adds to the discomfort. At a varying period of the attack, but always in my experience after the visual symptoms

I. Kovalevsky, p. 47. Diagnose St. Bon's Treatment.
have disappeared, two remarkable symptoms may appear, aphasia and numbness and tingling of the hands, arms or tongue. The nature of the Disorder of Speech is doubtful. In the two cases in which I have observed it, chiefly Consists in a difficulty in finding words to express the idea which the patient wishes and which is quite clear to him. In mild attacks by speaking very deliberately, he may contrive to speak coherently, in the more severe, he is wise to wait until the symptom passes off. I think the disorder is rather amnesic than due to the Coordination, since it is not words that are wanting, but the right words. Dring's excellent example of an in-
Coherent conversation which is very similar to some I have heard. The numbness and tingling is commonest in the fingers, hands and arms, and I have not observed it in other sites. Livinghouse quotes cases where it occurred in the lips and tongue and rarely in the lower extremities. I think the affection is purely sensory: in two cases which I have observed, and in which the symptom is very well marked, there is no impairment of motor power. In both my cases both hands were affected but the right first and most severely. Livinghouse observes that, out of 12 cases, in no instance was the left side alone affected where there was impairment of speech. Both my cases

1. Livinghouse, p. 88-9
had aphasia. Both these symptoms in my cases appeared when the headache was reaching its culminating, lasting about half an hour, and with their disappearance the headache and nausea began to decline. In some of Living's cases however they appeared with the vocal symptoms. I have not seen or read of any cases where the aphasia or numbness were the only feature of the attack. With regard to the vomiting Wallace says, I do not know what grounds, that it is proportionate to the acidity of the gastric contents. In some cases it is so great that the stomach rejects everything. Not uncommonly after the attack there is some diarrhoea, or a copious discharge of urine.
During the attack the face is pale, the eye sunken, the pulse slow, the extremities cold. With regard to the state of tension of the pulse there is, I think, considerable variation. Soft, compressible pulses are met with as frequently as those betokening high blood pressure. After a varying time, generally less than 12 hours, the patient falls asleep, or is able to get about. The after-state varies greatly. Some are comparatively well in a few hours; others remain in a languid state of mind and body for a couple of days, with often a slight remaining headache.

The Ophthalmic Form may, I think, be regarded as the typical fully-developed type of migraine, the other

forms described by various writers being merely milder or more severe cases. There is I think no one symptom that is constant, neither the ocular symptoms, nor the headache, nor the nausea. The affections of speech and touch are the least frequent and have not occurred, I think, except in the Ophthalmic variety.

A few cases are described of what may be called an abortive type where the ocular symptoms constitute the whole attack. The only case of the kind I have met with is in a patient who suffers from typical Ophthalmic migraine, and who occasionally, since his attacks have become milder, has the good fortune to find that the headache and nausea do not succeed. Linning quotes several
cases of this variety.

The commonest type is where the periodical headache is the only symptom, none of the other interesting phenomena being sufficiently in evidence to attract the patient's attention. The periodicity of the attacks, the character of the pain, and the usually well marked heredity, render the diagnosis obvious.

A more obscure variety which is probably of migrainous nature is that in which nausea and vomiting are the only symptoms. This type occurs in children, and its affinity to migraine may I think be inferred, from the family history, the periodical nature of the attacks, the absence of any obvious cause of vomiting, and the normal
state of health bi the intervals. Further, the accidental and uncertain nature of the exciting causes, the irregular periodicity of the attacks, and the fact that immunity is conferred for some time by an attack, strengthens the inference. I have only seen three cases of the kind. Dr. Cee has quoted 9 cases and regards them as being allied to migraine; he says the tendency to vomit passes off usually in a few years. Whether such cases later develop typical migraine is an interesting question. Suchling has met with several cases of periodical vomiting which he regards as migraine (Periodical Headache p.5) Colliquin quies as diagnostic points of migraine in children, recurring at-

1. On fitful or Recurring Vomiting. Reprint from St. Bartholomew's Reports vol viii. Cases quoted ibid p.118. See also cases 16, 17, 18 page 113.

2. In letter to author Jan 4th 1908.
tacks of vomiting lasting 3 or 4 days, attended with little marked headache, but with considerable prostration ... and sensibility to light and sound.

Cases have been described from time to time of what is probably a variety of migraine under the title of Recurring or Periodical oculo-motor paralysis.

Charcot, who was one of the first to regard this condition as a variety of migraine, suggested the title of Migraine Ophthalmoplegique, the name by which it is now commonly known. It consists in periodical attacks of migraine, unilateral headache, nausea, and vomiting, which pass off leaving a varying degree of paralysis of the eye muscles both internal and

. External supplied by the 3rd nerve.
The paresis is of varying duration but
at first usually passes completely off
before the next attack. With successive
attacks however the condition tends
to become permanent. With rare ex-
ception only one eye is affected. The
patients are usually children or young
adults and most of the cases quoted
belong to the poorer classes. I cannot
find a case where cure or spontaneous
arrest has taken place. Living
seems only to have seen one rather
doubtful case. (vide Cases page 122)

There have been described, under
the titles of the Transformations or the Equi-
valent of Medicine, certain diseases which

1 Living p. 424. 5 On migraine and sick headache.
2 " p. 204.
3 Kovalevski p. 104. La Migraine & son traitement. 1902.
alternate with or replace typical attacks of the malady. Living describes a case of a doctor who suffered from periodical stomach pain for some time which was replaced later by attacks of headache. Kовалевский relates a case, where severe pain in the right side of the chest replaced the headache in a migraineous patient, the vomiting and ocular affection remaining as before; and another where heart burn alternated with the headache in different attacks. Both these writers also quote examples of Aollen replacing migraine. Of the connection between epilepsy and migraine I have spoken before (p. 87). Kовалевский says they have the following affinities: 1. They are both hereditary. 2. They alternate in the same family and person. 3.

They both appear periodically from accidental exciting causes. 4. They are both followed by exhaustion. 5. Both often accompany the uric acid diathesis. 6. Both may be followed by paralyses e.g. ophthalmoplegia.
Anatomical Site of Migraine.

Very little is definitely known. Schulenburg, who is chiefly concerned with the headache, thinks it is in the branches of the Trigeminal and Sympathetic which go to the Dura Mater. Vernet is of the same opinion. Lissner thinks the site is limited to the sensory tract and the ganglia of the sensory nerves from the optic thalamus above to the nucleus of the trigus below. Jackson says the lesion is in some part of the Cortex of the posterior lobe, and that the visual symptoms are probably accounted for by a discharge of nervous elements in Ferrier's visual centre.

Against this latter theory is the fact that the Cerebral substance seems under normal circumstances to be destitute of sensibility.

1. Schulenburg op. cit.: 1878 vol. XIV.
2. Vernet, op. cit.: p. 507, footnote. Rue, Paris: de Réd. 1877 vol. II.
Towers says "loss of speech must be due to disturbed function of the cortex. The sensory symptoms in the limbs is like that which in far more rapid evolution preceded convulsions from cortical disease, and this source is therefore probable. The hemianopia also is best explained by the assumption of deranged function in the occipital lobe, especially since Right hemianopia may correspond to almost simultaneous aphasia. Sympathetic nerve fibres accompany the arteries in the cerebral substance: there is reason to believe that the functional state of the cortex itself influences the state of its arteries (as is the case in all the other organs), and this must mean a relation of the cells of the cortex to the parietal motor centre: hence it is quite possible that there may be a sensory representation of the substance of the brain, at least of its interstitial tissue, in the cortex of the brain itself."

1. Towers, Diseases of the Nervous System vol II p. 857
2. Ibid p. 851.
Diagnosis - In the more pronounced cases the diagnosis is simple: often the patient volunteer the information that they have sick headaches. In cases commencing after 35, it is necessary to exclude the possibility of organic disease e.g. auralgia, where the simulation of migraine may be falsely close. Chronic glaucoma may cause paroxysmal headaches. The headaches of hysteria, when characteristic, should present no difficulty, but in migrainous women about the menopause, migraine is often complicated by hysteria. In the rare disease Lead Encephalopathy, excruciating paroxysmal headaches are said often to be a prominent symptom. In children the diagnosis is more difficult, inasmuch as the attacks are seldom typical before the age of puberty.
but periodical attacks of vomiting, or in the older children, headache without any symptoms of gastric disturbance or other obvious cause, should excite suspicion as to their nature. Headaches of reflex origin from the naso-pharynx—adenoids, rhinitis, polypi—are said to be accompanied by nausea and vomiting.

Prognosis - It is probable that migraine seldom or perhaps never menace the life of its victim. Disease relates several cases where the patient developed organic cerebral disease, and while admitting that such an event is rare, he concludes that a hereditary tendency to migraine indicates also a tendency to premature cerebral disorganization at a later period of life, or that the constant return of the seizures impairs the nutrition of the brain and predisposes to haemorrhage and softening. Kovalenko says, "Il est vrai, personne presque ne meurt à la suite de la migraine; mais si nous nous rappelons des cas où la migraine est suivie d'hémorragies provoquant des aphtes, des monoplegies, des

I. Pellélon - de la migraine 2e ed. p. 66. - Salzmang, Zervinsky, Cyclo p. 22.
II. Vermeil: Traité Prat de Méd. Tom i p. 608.
III. Kovalenko p. 169 734-140 des Migraines sans intermèdest
Hémiplegie, le status hemicranicus re: la
mort en est très peu éloignée. I do not
think there is adequate proof of either of these
statements or that the cases quoted are other
than coincidences. While gout coexists,
these disorders are likely to occur, but proof
is wanting that migraine perse influences
the circulation deleteriously. Pulsatility of
temporal arteries occurs in my observation
just as frequently in non-migrainous
people. Where the state of health between
the attacks is satisfactory I do not think
that migraine shortens life. Where
however the attacks occur so frequently
that a virtual status hemicranicus is estab-
lished the mental condition may be a
pitiable one, but here again migraine is
usually only one symptom of the state of
health, and not the cause of it. Still by interfering with the power of work and capacity for keeping engagements it may lead to a depressed and hypochondriacal state of mind which is said to have in some cases culminated in mania. Kralievski says: "Le prognostic de la migraine par rapport à la vie du malade ne doit aussi être porté que avec prudence, car souvent la personne souffrant de migraine est menacée, si ce n’est de la mort, dans tous les cas, d’un état invalide, qui est souvent pire que la mort." The forecast as to the cure of the complaint is even less satisfactory. Where the general health and conditions of life can be improved much benefit may accrue, but migraine, in otherwise healthy people is in my experience very intractable. In a certain
proportion of people the malady ceases in intensity or disappears completely with advancing years, but even in this respect the prognosis requires to be very guarded.
Treatment. There are not many maladies for which more numerous or more diverse remedies have been proposed than for migraine. Not to this surprising, considering how obscure is the nature of the disease, and how capricious its symptoms in each individual case. Pellérat speaks jestingly of the "médicaments infaillibles et admirables" of the times preceding his own, but he is himself sceptical about the virtues of any specific remedy. Not only is the cure of the disease rendered difficult by the obscurity of its nature, but the actual relief of the paroxysms is hindered by the fact, often observed, that once the attack is fairly under weigh, both secretion and absorption from the stomach are greatly arrested, where the migationous tendency is attended by any obvious departure from health.
anaemia, the remedying of such conditions may affect a marked amelioration of the malady, but very often, and especially in men, the condition of health between the attacks is perfectly normal. To such people, the administration of drugs toward off their attacks, is likely to prove of doubtful benefit, nor indeed are they disposed, as a rule, to submit to anything of the sort, having very often lost all faith in treatment both prophylactic and curative. So that I think, in the present state of knowledge, the aim should lie to prevent the establishing of the malady while the patient is sufficiently young to choose this mode of life. It is certain that an open air life is immicic to migraine, no doubt by its tonic influence on the
nervous and digestive systems. Even in inwetereate cases, change of air, food, 
Combined with plenty of exercise in the open air often works wonders. The 
benefit accruing from a visit to one of our Hydrostatic Establishments is an 
example of this. But such benefit is usually only temporary and the trouble 
returns when the old conditions recur.
If, however, the affection is recognized in 
Childhood, I think the adoption of an active open-air life will offer a fair guarantee 
that the malady will not become established. While the habit has been formed, 
after remedying any obvious defects of health, most benefit is likely, to be obtained 
by an easy out-of-door life, observing 
a due proportion between rest and exercise.
I have not found dieting of much advantage. Haiq, however, maintains
that migraine is curable, by diminishing the amount of uric acid introduced in
food, by avoiding animal foods, soups and extracts that are rich in it, also, strong
tea, coffee, and vegetable alkaloids, after clearing out old accumulations of uric acid
existing in the body. I have tried in several cases in the manner he indicates, but
with scant success. The drugs most fre-
quently used for averting the seizures are
probably the Bromides and Arsenic. Brunton
speaks strongly in favour of Potassium 4
Bromide and Salsalicylate of Sodium. Smidler
says he has had good results from the
fresh fluid extract of Cannabis indica.

2. Ibidem
3. Practitioner Feb 1894 p. 105
The prolonged exhibition of these drugs usually leads to impairment of the general health. I have found the occasional use of Blue Pill and saline purgatives of real service. The writer in the Encyclopaedia Medicâ says "Treatment directed to the bowels and blisters is of primary importance, and is more likely to be attended by success than treatment directed specially to nerve tonics and the like." Whitehead says he has "never failed to treat successfully the most intractable and severe cases of migraine by the introduction of an ordinary tape roll at the back of the neck." One of my cases had immunity from attacks while suffering from a large patch of ringworm of the scalp:

With regard to the treatment of the
paroxysms, one of the most successful
measures, when the patient is young and
robust, is physical exercise. This has
also been observed in gout and asthma,
where the patient has sufficient resolu-
tion, an hour's fairly violent
exercise, especially if carried to the point
of perspiration, will shorten the attack
and diminish the resulting malaise.
Such a measure is only applicable as
a rule in the case of young and healthy
subjects. Probably, the stimulation of
the circulation and increased metabolism
results in the specific elimination of the
materials morbi. I frequently advise
this course in intractable cases. Generally
T. Balfour. The Devil's Astart 1894 p. 171
2 Lukers p. 453
with favourable results where there is courage to adopt it. The most intractable cases are those where the sensory symptoms are pronounced, and those in which sickness and vomiting are features. In neither of these types have I found drugs of much benefit except a large dose of alcohol at the beginning of the attack. The synthetic coal tar products are generally useless here. In cases, however, where headache is the only marked symptom, those with Bromides and Caffeine, taken early are often efficacious for a time, but gradually one by one lose their effect. Hâig, in consonance with his theory of Caudation, advises clearing the urine, acid out of the blood by means of 1. Hâig. Uric acid in caudation of disease 2:57/5.130
some of the drugs which he says have this effect. He uses Calomel 1 gr. every half hour for 3 or 4 doses with Salmiaco to the stomach and morphia subcutaneously. 2. Galvanism is said to be of service, but such measures, as also lavage of the stomach, emetics, compression of the carotids, are either quite impracticable or as bad as the disease.

2. Heden p. 130
J. L. male 31, single; attacks commenced at 10,
at 25 had reached their acme, thereafter decreasing
in violence and frequency. Tattie, motion and pat.
ernal grandfather had angina. Tattie died of
angina pectoris. Chronic rheumatism and phthisis
in family history. Patient hasicteric lips of con-
puncturae; extremely healthy in other respects. Has
thick temporal arteries. Attacks at first consisted
of headache only; about puberty, eye symptoms
began to show in the attacks, consisting of hemiplegia
and zig zag spectacles. These lasted as a rule for
20 minutes to half an hour, the headache appearing
before they passed off, beginning over the left
orbit, and gradually extending over the frontal
region, with nausea, aphasia and numbness
and tingling in right hand and sometimes
in left. During attack face is pale and
drawn, the pulse and temporal artery normal.
Attacks very irregular, more frequent when sedentary. Can assign no exciting cause. Sometimes has foreboding of attack, generally not. Severity of attack lasted 5-7 hours and considerable headache and malaise for 48 hours. If he gave in to attack and went to bed the symptoms were more severe and the resulting malaise greater than if he kept about. A loose motion generally followed. After the age of 25 the attacks diminished in number and severity, and now often only consist of a transient hemiplegia and a slight attack of diarrhoea. Icteric tinge of conjunctiva more marked after an attack. During the violent period of attacks tried in turn most of the drugs recommended but with no benefit. Celtic in curing or preventing. A short walk of 5-10 miles, commenced when the ocular symptoms appeared,
shortened and diminished the severity of the attacks, and greatly reduced the resulting malaise.

Case II.

W.M.C., male, 40, single. Has had attacks since he can remember. Mother had periodical headache and died of cerebral haemorrhage. A brother and sister also have migraine. Another brother has epileptic attacks, but probably of traumatic origin. Violence of attacks has not diminished with advancing years. Can assign no definite cause, but has premonition of attack chiefly he thinks from the time elapsed since the last. Begins suddenly, with "dizziness and spots before the eyes," which lasts for half an hour, then headache which lasts for half frontal region and gradually extending to the other side. The headache is much
worse when he shakes his head—it feels "as if his brain was loose in the cranium—and in left fingers occasionally numbness in right hand. Vomiting is a sequel that attack is passing off. During attack face is pale, and the pulse slow and of average tension. Last about 12 hours and leave little headache or malaise. Sometimes has attacks during sleep, waking with a slight headache which soon passes off. Drugs have occasionally been of service, especially the coal-tar dyes, but vigorous exercise during attack is most serviceable.

Case III.

C. D. 31 male, single. Attacks commenced about 15 or 16 and are continuing unabated. Father had similar headaches, and suf-
free from "rheumatic fever." A brother died in status epilepticus, but epilepsy was probably traumatic in origin; known no special exciting cause but believes his stomach has something to do with it. Attacks begin gradually, on rising in the morning, with slight frontal headache. Nausea comes on by degrees and violent retching and vomiting follow but afford no relief. After 9-12 hours he falls asleep and wakes faint, well. Face pale during attack, pulse slow and soft. Attacks more frequent in spring and winter. Treatment during attacks of little avail as stomach recto evacuates everything. Arsenic given once, nearly, continuously, for 6 months, diminished the frequency. A large patch of scurfy skin developed a year ago on his scalp and lasted for 4 or 5 months.
during which he had comparatively few headaches. When it healed they returned as before.

Case IV.

N. B. 22. F. Single. Has had headaches since puberty. Father died of General Paralysis of the Nervous System. Mother has headaches and chronic muscular rheumatism. Patient is slightly anaemic. Catamenia most frequent exciting cause, but occur at other times from trivial causes. Began suddenly with "pontal blindness," and bilateral frontal headache follows with slight temporary aphasia, no vomiting and but little nausea. Last about 12 hours, and leave her prostrated. During attack face is pale, the eyes sunken, the pulse slow and of average tension. Attacks
seem quite irregularly except at the catamenia, and are more frequent in spring and late winter. Occasionally, Phenacetin, Antipyrine and Caffeine at commencement of attack give some relief. Between the attacks Iron, Arsenic and strychnine increase the intervals but do not affect the intensity of the attacks.

Case V.

Mrs. L. H. H. Has had headaches since she can remember. Father died of heart disease.

Mother had acute rheumatism several times. and suffers from floating images. Patient is very nervous and excitable. Worry or fatigue invariably cause an attack, but they frequently occur without known cause.

Begin suddenly, with dizziness, then headache at first, frontal, bilateral, later occipital as well.
a good deal of nausea, but no vomiting. Duration 8-10 hours and slight residual headache for next day. During attack face is pale, and the pulse slow and of high tension, as it is normally. At height of headache her ideas are confused and she is unable to work. She also occasionally suffers from facial neuralgia but readily recognizes the difference. The attacks have lately (menopause) been more frequent but less severe. Prophylactic treatment has not been of any avail. Bromide and antipyrin given early mitigate the attack somewhat.

Case VI.

C. M. L. 12. F. daughter of Case VI. Mother says her headaches commenced about 7 and at first were not frequent or severe. Now
Hay occurs about once a month. Pale, nervous child: had rheumatic fever at 10. Headaches frontal and apparently bilateral: no sensory symptoms otherwise, but refused bread when suffering. Spectacles have been tried but without benefit. Drugs have not had a fair trial.

Case III.

F. A. C. 41. M. married. Mother had periodic headaches, and father was rheumatic. Attacks commenced after he left school about the age of 17. Does not know any special cause nor when the attack is impending. Brief sudden mitral insufficiency, loss of appetite, bilateral frontal headache and nausea. He told he has sometimes difficulty in articulating, and has to speak deliberately.
Numbness in right arm and hand very marked with pins and needles in fingers. This latter symptom commenced four years ago and caused him some alarm. It occurs at the height of the attack and its disappearance is normal that attack is passing off. Face is pale and pulse slow and of high tension. Attacks last 5-8 hours and leave little malaise or headache. In early days he tried many drugs, but had little benefit. He takes an occasional blue pill and Scidle's powder prolonging the intervals between the attacks, and occasionally avert one impending.

Case III.

T. G. W. 38 M. married. Father suffered from regular gout and died of gouty cancer.
Paternal grandmother had periodic headaches. Phthisis in mother's family. Attacks commenced about puberty. Begin gradually, on rising with a sense of weight and fullness in head; bilateral partial headache gradually comes on, with great prostration and depression. No other sensory symptoms. Face aches during attack. Pulse slow and hard, and temporal arteries (blisters) small and hard. Never has attack in warm weather. In winter occur about once a fortnight. Duration 6-12 hours. Health between attacks normal. Has always muddy sclerotics, and more so after attacks. Not much residual malaise or headache. His usual anchor is half a tumbler of whisky, brandy, lauter before the headache.
Two years ago he went to live in the Tropics, since when he has not had a malarial attack.

Case XX:

F. J. 30. F. Simple, sister of case VIII.

Slightly anaemic, very nervous temperament. Attacks began about puberty, and have continued unabated since. They differ from her brother's, in that she has some ill-defined psychic symptoms preceding the headache, and occasionally nausea and vomiting. The attacks accompany the catamenia, but occur also at other times. They last 6-9 hours and leave considerable headache during next 24 hours. The face is pale during the attack, but the radial pulse shows no alteration. Only occur in winter and spring. Change of air gives immediate relief.
for a time. Iron, arsenic and strychnine
seem to diminish the violence of the
attacks, but not the frequency.
Case X.

Mr. B. 36 married. Father had asthma
and chronic rheumatism. She herself used
to suffer from leucorrhea. Had no head-
aches to speak of till about 25, then an
awful change in her circumstances took
place, and since then they have been very
frequent, occurring nearly always at the
catamenia, and occasionally at other times.
From any worry, emotion or fatigue.
Headaches have been nearly absent
during three pregnancies, but commence
again directly she is able to get up.
She often has facial neuralgia as well.

But not gradual on rising with slight head-


ache chiefly frontal and bilateral, but occasionally occipital as well. Sometimes nausea and vomiting which gives no relief. No other sensory symptoms. Face pale and haggard, pulse slow and soft. Only no relief by sleep. Not much malaise or headache next day. General tonic heat. ment has diminished the frequency of the attacks except at the Catamonia. A large dose of Bromide and Antipyrin early in the morning seems to diminish the violence of an attack.

Case XI.

S. T. 37. M. Suffers from spasmodic asthma, and chronic rheumatism. says his father and mother were both very nervous people, but does not know if they had headaches. Attacks commenced about 21 when he took
up a sedentary employment: since then his asthma has troubled him much less.
Attacks very irregular, twice or three times a year. They are followed sometimes by profuse salivation lasting for several days. Has no warning of attack nor any premonitory symptoms: sudden headache frontal, beginning on left side and becoming bilateral. No sickness, but great mental confusion and inability to arrange his ideas. Attacks last 8-12 hours, passes off gradually, and in about half the attacks is followed by salivation. The face is pale: nothing characteristic in the pulse. Large doses of alkalies sometimes prevent the succeeding salivation, which is very exhausting when it occurs.
Case XII.

D. E. F. 21. Has had 2 or 3 epileptic attacks each year for the last 4 years. Suffered from most obstinate constipation: robust and full-blooded. Her mother was subject to headaches: no history of epilepsy. Headaches commenced about puberty and occur at each menstrual period, commencing just before the flow and lasting for about 12 hours. Bilateral frontal. Seldom occur at other times. Have no obvious relation to the epilepsy. Right arm is almost paralyzed as a result of early Infantile Paralysis. There are no other sensory phenomena. During attack the face is pale and drawn and the pulse slow and of markedly, high tension. Relief of the constipation does not influence the headaches. Bromides have been given for protracted periods, but with no benefit.
either as regards the Epilepsy or the Migraine. She became a vegetarian six months ago, since when she has not had an epileptic attack; she thinks too the headaches have been less severe.

Case XIII.

Mrs A. 38, single, romanist. Fainted suffered from rheumatic joint. Two sisters are hysterical but free from migraine. Does not remember when she had not headaches. At first she thinks they were one-sided, now they are bilateral, frontal, and very often occipital as well. Onset gradual usually from some trivial cause such as emotion, shopping, railway journey, irregularity in meals, and increase in violence for 5 or 6 hours when vomiting gives relief. Sometimes has "mist before
the eye preceding an attack, but it is evidently not pronounced. Is prostrated completely for the time being but there is not much residual headache or malaise. During attacks face is pale, the pulse slow but not marked in character. Attacks occur about once in 3 weeks, and only occasionally at the menstrual period. Has taken enormous quantities of Bromide atropine, phenacetin &c. with relief at first, but has now abandoned them. A change of air and surroundings gives complete immunity for the time. Before her annual holiday the attacks are more frequent.

Case XI.

Mrs. F. H. 44. Obese, no history of use in family. Lived in West Indies till 4 years ago, when she married for the second time.
and came to live in this country. She is childless. The attacks invariably follow sexual excitement. They commence gradually, in the morning, bilateral frontal and occipital and last till night with considerable nausea but no vomiting. They are sometimes accompanied by distressing yawning. Did not have headaches before her second marriage. Face is pale during attacks, pulse slow and compressible. No albumin in urine. Is quite well when the cause is removed. Bromide of Potassium has been of some benefit in diminishing the severity of the attacks.

Case XV.

Miss G., 21. Single, a healthy but very nervous girl. Her father has some nervous affection of the throat. Her mother used to have
frequent headaches and now at 47 suffers from attacks of numbness in both hands. One of her brothers was a hydrocephalic idiot, and a sister aged 11 has headaches. Patient like most migraineous people I have seen has a very unstable vasomotor system, flushing easily from slight causes. Her manner is rather hysterical. Her health between the attacks is good but the frequency with which they occur have rendered her rather dependent. They occur more frequently in winter sometimes twice in one week. No known exciting cause. Do not occur specially at the Catam Macedonia. Onset gradual, beginning on rising, with well defined ocular symptoms, going onto bilateral frontal headache, severe nausea and vomiting. Last all day; relief only comes with sleep.
Face is pale during attack: eyes sunken and whole expression one of great misery. She shows no craving for sympathy. Pulse is slow, otherwise normal. She was found to be astigmatic, but spectacles have not affected the headaches. Bromide, antipyrine, phenacetin, caffeine have each in turn been of benefit for a time. Frequent holidays and changes of air have proved most serviceable.

Case XVI.

A. P. 3. Male, a healthy looking child. His mother has had slight periodic headache for many years. He was breast-fed. At 18 months began to have bilious attacks, and has had them every 2 or 3 months since. They consist of attacks of vomiting lasting 6 to 18 hours.
sometimes slight, sometimes severe, without obvious cause or relation to food. The tongue is slightly coated during an attack, the bowels act as usual, and the stools are normal. For some hours beforehand, the child is listless and irritable. He recovers quickly when the vomiting stops. The next day is in his usual good health. He complains of no pain. His mother knows by his listless appearance when an attack is threatening, and attempts have been made to avert it by means of aperients, but unsuccessfully so far.

Case XVII.

M. C. Y. a pale delicate girl. She suffers from night terrors and enuresis. Fattier and mothers alcoholic. She had Scarlet Fever at 4, and since has had irregularly
recurring attacks of vomiting (two during last year) without obvious cause. For a short time before each attack she looks out of sorts and complains of discomfort in the region of the stomach. Duration 6-24 hrs. There is some constipation, the tongue is furred, clean, there is no increase in pulse rate or rise in temperature. Anorexia complete during attack. Complains of no headache. Recovery very quick when the vomiting stops. She has only had two attacks for the last 12 months; formerly, they were more frequent, occurring every 2-3 months. This result is probably due to her taking Syrup of Ferris Jodidi. During the attack, Tincture of Jodide, 1/2 drop does frequently helps to keep the vomiting in check.
Case XVII.

M. A. F. 10. a thin, nervous girl. Her father is a healthy but very excitable man; migraine is prevalent in her mother's family. She suffers from habitual constipation. The attacks commence gradually, with loss of appetite for a day beforehand, gradually increasing nausea, which culminates in vomiting. The stomach resists everything and especially acids, specially the drugs that are used to allay sickness. The pulse is slow at the beginning of an attack but becomes quick towards the end and is feeble throughout. The urine is clear, and there are no symptoms of digestive derangement, except leucocoea over the stomach, and then only when vomiting has continued for some time. The other systems are all apparently normal.
The attack lasts now about 12 hours, but has lasted over 48 hours. She never has an attack in warm weather but each winter since the age of 6 she has had two severe attacks until this winter when she has been immune. There is no known exciting cause except the fact that the attacks always occur in cold weather. Careful attention to diet and theadministration of the tonics did not seem to make the slightest impression on the attacks. During the last year she has been leading an easy out-of-door life and to this I attribute her immunity during that time.
Dr. Gee's Cases.

I.

Oswald A. 6. Has been subject for 4 years to fits of vomiting. Each attack lasts 1 hour or so. At first brings up the food in the stomach, later mucus while. Pain in left hypochondrium attends and sometimes precedes the vomiting. No error in diet to account for attacks. After measles attacks became more frequent, occurring every week. Then, during stay at seaside, had only one attack in 3 months. Bowels constipated at time of vomiting, not at other times. No headache; no sign of organic disease. Falls in subject to headaches.

II.

B. male 5. Vomited excessively as a baby, though not often. Is still subject to attacks, lasting a whole day though not so frequent. Later attacks have taken on the form of retching.

St. Bartholomew's Hospital Reports 1911. Reprint.
intant vomiting. No pain. Exciting causes are extreme excitement, and travelling inside a vehicle.

Case III.

Donald C. 4½. For 12 months has had attacks of vomiting (followed by diarrhoea), the whole lasting about 12 hours. Shortly before and during attacks, the stools are wanting in colour. He is sleepy before attack, and is weak for a few days after. Fatigue, e.g. a railway journey, is liable to bring on an attack. No headache or other signs of disease.

Case IV.

C. F. H. Since she was 18 months old she has had 4 attacks of vomiting, each preceded for a week by a furrowed tongue. Attack lasts a few days, is attended by emesis.
-ative and leaves her very weak. No headache or fever or other sign of disease.

Case V.

Percy G., 5. For last 2 years has had 5 or 6 attacks of vomiting. For 48 hours from beginning of attack, vomiting too frequent and severe as to induce dangerous weakness and faintness. There is some fever. They last altogether a week or 10 days. Bowels are unaffected; there is no pain; quite well in intervals. Urine normal. His father and father's father subject to migraine.

Case VI.

Helen V., H. 6½. From age of 14 months has had attacks, about once in 6 months, of vomiting lasting for a day or two. Besides the vomiting there was pain in the epigastrium, drowsiness, and white motions. The vomiting
CAUSES WERE COLD AND INDEGESTIBLE FOOD.

Case III.

Gertrude 2.b. For 18 months has been subject to feverish attacks, with violent vomiting, lasting sometimes two days, never less than 5 or 6 hours. No headache, sometimes has nightmare. Both parents subject to headache; the mother is liable to perfect morgin, temporary aphasia and numbness in the right side of the face and right limbs.

Case IV.

Grahame R. 5. All his life has had attacks of great pain in the belly, lasting several days, accompanied by vomiting sometimes by diarrhoea, never by headache. No cause known; no signs of organic disease.
Migraine Ophthalmoplegique


Maria S. 19. Suffered from age of 12 at intervals of 6-7 months from attacks of left-sided frontal headache, nausea, vomiting and vertigo, followed by ptosis. He found complete paralysis of the right internal muscles of the eye, with ptosis, dilatation of the pupil, and paralysis of accommodation. After 6 days, improvement took place, the pain and vomiting ceased, and the ptosis diminished. At the end of three weeks, the muscles had recovered except the right superior; there was still a trace of ptosis. Two years later Sundby observed a similar attack in same patient and 4 weeks after the paralysis was still persisting.
II.

Saudly: Lancet 10th Jan. 1885.

Mr. R. J. admitted to hospital with malaise and pain over the right eye. A year before he had been admitted with pain over the right ear, a degree of ptosis of the right pupil, diplopia. There had been a discharge from the left eye and some paresis of the facial nerve on that side. Three days after his second admission, there was right sided ptosis, paresis of the rectus internus. He saw double and when he walked covered up his right eye. The lower part of his face was not quite symmetrical, the mouth being drawn a little to the right.

No other signs of disease.


A little girl of 8 had from the age of 16 months attacks of headache with vomiting.
with pronounced ptosis of the left eye. One of the attacks occurred in hospital when there was acute pain over the left eye-brow, complete paralysis of the 3rd nerve on the left side, and of the muscles supplied by the left facial nerve. Two months later the movements of the eye-ball were still imperfect, and the pupil scarcely reacted to light.

Ernest Clarke observed a case of Recurring oculo-motor paralysis in a girl of 12 subject to attacks of migraine every 6 weeks after which divergent strabismus, ptosis and dilatation of the pupil occurred and lasted several days.

IV and VI.

British Medical Journal.


Mans. 27. Migraine had existed since age of
10 but only for the last 7 years had the eye been closed into the attacks. The attacks, at first at intervals of about 8 weeks, now occurred every 2 or 3 weeks; they lasted 3 or 4 days. The palsy of the 3rd nerve was practically complete: ptosis and paralysis of the ocular muscles, including dilatation pupil and palsy of accommodation. The attacks commenced with vomiting and headache. The ocular palsy in the interval did not completely cease off, and the latest accounts, two years after, indicated that the drooping of the lid was becoming more permanent.

Girl. 18. She had two attacks at intervals of four years though migraine outbreaks continued in the interval. Each time she had made a perfect recovery.
though the 3rd nerve was not, at the worst, as completely involved as in the last case. Recovery was much longer in taking place. Mr. Seward remarks that the shorter the interval between the attacks, the more rapid appeared to be the recovery.

VII.


A boy aged 15 had complete paralysio of the left 3rd nerve when a year old; recovery took place, had a second attack at 7 years, then since had had an attack every 9 or 10 months. He was subject to bilious attacks with intense headache in the left side and paralysio always came on during a bad attack. There was some atrophy of the left optic nerve, and some of the paralysed
muscles has never recovered. The present attack was passing off, but there was still slight ptosis, a dilated pupil and complete paralysis of the external muscles of the eye supplied by the 3rd nerve.

VIII.

Noon. Saturday Feb 28th 1891.

George C. D. Has suffered for last 5 years from recurrent attacks of migraine consisting of left sided frontal, and slight, occipital headache with nausea and vomiting, slow feeble pulse, and great prostration: also increased lacrimation, discharge of watery mucus from the left nostril, great intolerance of light, prominence of left eyeball and increase of intraocular tension. Gradually increasing paralysis of the third nerve then follows, the various
Branches being affected in the following order of severity: the levator palpebrae superioris, rectus superior, and obliquus inferior are completely paralyzed. The rectus inferior is almost completely paralyzed, and the rectus internus partially. The pupil remains halfway between contraction and dilatation and reacts but slightly to light and distance. Marked diplopia. During height of attack child seems extremely ill: face pallid, expression anxious, tongue furrowed, bowels confined, urine scanty, and high coloured: complete anorexia. After unavailable time pain and sickness cease almost suddenly. The paralysis remains for a day or two but gradually passes off. Later, attacks have been more frequent and severe and have left more and more
Residual paralysis, i.e. at the present time there is almost as much paralysis between the attacks as during one. Vision in the left eye is much impaired. He has had attacks every 3 or 4 weeks since the age of seven, and if he goes 4 weeks without an attack the next is proportionately severe. His health is good between the attacks. No family history of migraine.