The subject being a very rare one, could not be compressed very satisfactorily in the limited space of a thesis. But Mr. Hespman has given an account of the fly fly or Bailli of Vasa which leaves nothing unturned, but the wing is turned. On the other side, there are a great deal of facts and say all that can be said, which is not to mention any name, for I have to do with Name.

by

James Munro.

1859.
In accordance with the established laws of the far-famed University of Edinburgh, that each candidate presenting himself for the degree of M.D. must write a disputation on some medical subject, we beg to submit the following.

The Urine,
Its Physiology and Pathology.

It is our intention in the following pages to treat of the urine — a most useful and important subject — and in order to do so briefly, (as the limits of this essay demand) yet comprehensively, we shall adopt the following arrangement:

1. We shall commence by a brief consideration of the physiology of the urine, treating of, under this head:
   1. Its separation and physical properties — and
   2. Its chemical composition, or constituent...
in a state of health, and the origin and uses of these constituents.

II We shall then go on to consider what shall form the principal part of our paper viz:—

The Morbid Conditions of the Urine, of which we shall treat as follows:

1. Substances occurring in the urine in abnormal proportions, or in other words excess or diminution of the normal constituents.

2. Substances found in the urine not normal ingredients thereof, such as albumen, sugar, blood, bile, xanthin, chyle or fat, pus, spermatogonia, oxalate of lime, opium &c.

(1) Separation of the Urine.

The separation of the urine from the blood, both as a secretion, and as an excretion for purifying the latter, is effected like other
Secretions by the agency of Cells.
Those Cells, situated in the renal depurating organs, have like the cells of the different tissues of the body, special attractive and selective properties, by virtue of which they are enabled to abstract from the blood those substances which constitute their secretion, and which pre-exist in that most complex of all fluids, such is their selective property.
But the Kidneys being excretory organs, also discharge substances which have entered the animal economy (and may prove deleterious) if these are brought to them in the soluble form. This constitutes their excretive property.
The urine, then, this peculiar secretion and excretion, consists of water and certain saline, and other ingredients in solution. The watery part of the urine is supposed to be secreted in the Malpighian Corpuscles of the Kidney, whilst the dissolved ingredients are eliminated by the cells lining the tubuli urinifere.
The secretion of the Urine is rapid in comparison with
with other secretions. The watery fluid washes the salts down before it in the urinary tubes, and is thus propelled into the pelvis of the kidney. It then passes from it by means of the ureters into the bladder, and by virtue of the contraction of the muscular coat of this viscous, distended by the abdominal muscles, it is discharged from it by the urethra.

The secretion does not enter the bladder at any regular rate. During fasting, it is said a few drops enter every minute, but its flow is increased shortly after meals, as also during a deep inspiration — on straining, in active exercise — by mental anxiety — but above all by diuretics.

In a case which we had an opportunity of observing lately — there was a deficiency of the lower part of the abdominal wall and rectum, as also of the wall of the bladder, where the ureters opened, so that the flow of urine might be distinctly seen from them. The urine was observed to be expelled in the form of drops, pretty rapidly succeeding each other — with now and then a tiny stream.
stream forced out as if the drops had for a few moments accumulated. The urine then having collected in the bladder until it is filled, or occasionally by the bladder, the discharge being either forced by the will, or beyond the control when it dribbles away incontinence of urine, or during a comatose condition of the individual.

Having thus briefly stated the process of separation of urine from the blood, and its subsequent expulsion from the body, we shall in a few words describe its properties in order to a better comprehension of its morbid or abnormal conditions.

Physical properties of the urine. Healthy urine is a clear, limpid fluid of an amber colour, having a peculiar and characteristic odour, which becomes pungent and ammoniacal when decomposition of it takes place.

It holds in solution a variety of substances, both organic and inorganic, as well as a quantity of urates derived from the urinary passages. Although ordinarily of a pale yellow, yet in health
the urine may present a difference in colour, (from various causes, such as the degree of dilution) varying from being nearly colourless to the deep yellow, or light brown hue. When much diluted the urine presents a faint greenish tint, as in early infantile jaundice. Another instance showing the connection of its colour with the degree of dilution is afforded by the bluish appearance of the urine in certain cases of oedema when collected in large quantity, and in a deep vessel; this being due only to the concentration of yellow; as we know from diluting it with water. The urine may also present a reddish hue in health, from the substances which the individual uses as his food, such as beetroot, madder "kinds of strawberries" &c. It may be coloured red also by certain drugs which have been taken internally, but to this we shall advert hereafter when treating of haematuria. When just voided in health, the urine is slightly acid to test paper in man. But in this respect, it is remarkably influenced by diet.
(within the limits of health). Human urine is not usually rendered alkaline by vegetable diet, but is thus changed by the use of alkaline salts, or those along with vegetable acids, which latter are changed into carbonates before they are discharged from the body. The urine is even neutral during digestion, becoming again gradually acid until the next meal is taken, and is thus influenced by the amount of the acidity of the gastric juice, or when the gastric juice is very acid, the urine is less so. Then it is rarely alkaline, save when the mucus being profuse or abnormal and more act as a ferment to the urine, changing it into the alkaline carbonate of ammonia before its elimination from the bladder.

The specific gravity of healthy urine may vary from 1003 to 1030 (M.D. = 1000) depending upon the amount of solid and liquid food received into the body, the period of the day at which it is examined, the season of the year, the temperature of the urine, and other circumstances.

Thus urine passed shortly after drinking much water or other fluids (urina potata)
is usually pale in colour and of low S. G. S.,
varying from 1008 to 1009, while on the other
hand that which is secreted soon after
digestion of a solid meal ("urina chyle")
has a S. G. S. frequently as high as 1030.
So that this accounts for the extremes we
mentioned above.

The urine passed immediately after a night
rest ("urina sanguinis") is of a S. G. S.
var
ing from 1015 to 1025, and may generally be
taken as furnishing the average density of the
whole urine. Then this should be taken
as the standard, or else the whole urine passed
during the course of the day—either of which
will serve for all practical purposes.

But the density is also modified by the season
of the year, being of slightly higher density
in summer, as there is then more water dis-
charged by the skin than in winter,—the
skin and kidneys acting vicariously.

In disease the variation may be very great—
from 1004 in albuminuria, to 1040 or even 1050
in diabetes mellitus.

The average quantity of urine secreted in twenty
hours
four hours is subject to variation from the amount of fluid taken, state of the weather, and the healthy condition of the skin. The quantity discharged during summer is less than that during winter, in virtue of the superior activity of the skin during the former season.

The average quantity of urine secreted in 24 hours in a healthy adult ranges from 30 to 40 ounces in this country according to Prout. We may, for the sake of precision, estimate the quantity voided daily in summer to be 30 ounces on an average, while in winter it generally rises to 40 ounces — thus giving a mean daily quantity of 35 ounces.

(2) Chemical Composition of the Urine.

The urine is one of the most heterogeneous fluids known. As already stated it consists chiefly of water, holding in solution certain substances both organic and inorganic, with Urine, Extractive and Colouring Matters. Various most eminent Chemists have obtained different results by their analyses. For the sake of brevity, we shall only refer to the tables of Bessezilus and Becquerel — as being extremes in certain things.
followed by remarks from the observations of other 
chemists:

**Berzelius**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>933.00 (per 1000)</td>
</tr>
<tr>
<td>Mica</td>
<td>30.10</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>1.00</td>
</tr>
<tr>
<td>Lactic acid, lactate of Ammonia,</td>
<td>17.14</td>
</tr>
<tr>
<td>Sulphuric acid, lactate of</td>
<td></td>
</tr>
<tr>
<td>Ammonia</td>
<td></td>
</tr>
<tr>
<td>Mucous</td>
<td>0.32</td>
</tr>
<tr>
<td>Sulphate of potash</td>
<td>8.71</td>
</tr>
<tr>
<td>Sulphate of Soda</td>
<td>3.16</td>
</tr>
<tr>
<td>Phosphate of Soda</td>
<td>2.94</td>
</tr>
<tr>
<td>Biphosphate of Ammonia</td>
<td>1.65</td>
</tr>
<tr>
<td>Chloride of Sodium</td>
<td>4.45</td>
</tr>
<tr>
<td>Muriate of Ammonia</td>
<td>1.30</td>
</tr>
<tr>
<td>Phosphate of lime &amp; Magnesia</td>
<td>1.00</td>
</tr>
<tr>
<td>Silica</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1000.00</strong></td>
</tr>
</tbody>
</table>

**Bequerel**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>967.14</td>
</tr>
<tr>
<td>Mica</td>
<td>230.466</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>8.135</td>
</tr>
<tr>
<td>Phosphate</td>
<td>10.167</td>
</tr>
<tr>
<td>Sulphate of potash</td>
<td></td>
</tr>
<tr>
<td>Chlorides</td>
<td></td>
</tr>
<tr>
<td>Appurate of Soda</td>
<td></td>
</tr>
<tr>
<td>Fluoride of potash</td>
<td>Trace</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1000.00</strong></td>
</tr>
</tbody>
</table>
From these tables it would appear that Berzelius estimated the amount of urea twice as high as Becquerel; but it is probable that Becquerel's estimate may be rather low, or that those whose urine he examined lived much on farinaceous food, whereas the estimate of Berzelius again is probably taken from an examination of urine of a high Sp. Gr. Perhaps the mean average of these might be nearer the exact amount, we propose to adhere principally to that of Becquerel.

It is evident, however, from their analyses that they both agree as to the proportions which the various constituents bear to each other.

The urine is liable to considerable variation in respect to the amount of its constituents, as also to the proportion these bear to one another, in a state of health. The water is especially liable to vary in the several ways already noticed. It is remarkably increased in polydipsia on the one hand, and undergoes great diminution in Albuminuria on the other, so low indeed may it become in the latter case.
Case that sometimes only ten ounces of urine may be voided in the twenty-four hours. Hydrogen and Oxygen for the formation of water are also derived from the disintegration of tissue, as well as from the water received into the system, thus to keep off with the urine. A glance at these tables will shew us that the urine is composed chiefly of water.

Solids of the urine in a state of health.
These also are subject to variation in quantity from many causes, of which may be mentioned as the chief: (1) The kind of food used and (2) the amount of exercise taken, and consequent corresponding transformation of tissue undergone. Their relative proportions and their amount as a whole depend also upon the state of health, e.g., when symptoms are being developed in the body, it must follow that a larger amount of lime salts will be discharged by the urine—unless an additional allowance is taken internally.

The salts of the urine and of the secretions being derived directly from the food, vary.
of course, according to its nature, the soluble inorganic salts passing off by the urine, while the insoluble not being absorbed from the bowels, are discharged in the feces.

In the adult the salts excreted are precisely equal in amount to those contained in the ingesta, but this is not the case in the infant, more of them being retained in the latter to build up and solidify the bones. Now from what has been said above, we can understand how the salts of the urine will be somewhat altered according to those used in the food.

Urea forms about one half of the principal solid constituents of the urine, and is that compound by which most of the nitrogen of the "transformation of type", and of the imperfectly assimilated (wasted) food—according to Pouts—is eliminated from the body. The remainder of the nitrogenised compounds (i.e. that not discharged as urea) is got rid of chiefly as uric acid. But traces of kreatine and kreatinina—both nitrogenuous compounds, Gregory avery have been found in urine; and it is supposed—indeed...
indeed proven that Ammonia is evolved with the breath.

The secretion of Urine seems nearly provided for the removal of this effete substance - the product of disintegration of the tissues, which if retained in the system acts as a poison to the Nervous system especially producing most delirious, and very often fatal effects.

Urea also exists in small quantity in the blood in a state of health, and in Urine in albuminuria. That we have to state chiefly regarding the chemistry of Urea has been obtained from the perusal of Prof. Gregory's Organic Chemistry. Its composition is C₂H₄N₂O₂. It exists in the Urine in a soluble form, and can be procured from the said secretion in the solid form by evaporation in a watch glass, and adding a few drops of H₂O₂ when the nitrate of Urea crystallizes in rhomboidal plates, then the H₂O₂ can be disengaged by Ammonia, but further manipulation is necessary for its purification. It is neutral to test paper, but reacts with acids to form Salts. In Constitution it is identical with Cyanate of Ammonia (NH₂CO₃NO).
Wrea then may be artificially prepared although it is an organic product. When decomposed, as by keeping the urine for some time without attracting the urine — wrea becomes carbonate of ammonia (NH₄OCO₂) only requiring treatment of water, and thus renders the urine alkaline. The explanation of this decomposition we believe to be as follows: that the wrea by virtue of the instability of its particles, goes a change in the elements of wrea, so that it becomes converted into carbonate of ammonia. This is the only explanation that is suggested to us, when the lining coat of the bladder becomes diseased — as from chronic inflammation therein, or from spinal affection, the wrea becomes profuse, or abnormal, and then sooner decomposes the urine, so that the urine becomes alkaline before its emission from the body.

The same sometimes happens in some affections of the prostate.

The amount of wrea excreted varies according to the diet and water. It is secreted in greater quantity when the individual eats...
lives on animal foods, as Lehmann found from experimenting on himself, it was less when he used a mixed diet, and still less when he partook of a non-nitrogenous one. But we should regard that discharged from the use of a mixed diet as the normal amount, other things being equal.

We shall see when we come to speak of the speculations regarding polydipsia that the quantity of urea does not necessarily increase with the water discharged. It is in diminution in proportion to the other salts (but they are diminished also) in Albuminuria — hence the low Sp. Gr. of the urine then. We have an explanation of the imminence in diabetes mellitus and insipidus from the establishment of the fact that generally when the quantity of urine is much increased, the amount of urea as well as of some other constituents is increased likewise; hence there is a "chain" on the system.

We have every reason to believe that urea is derived principally from the "Détamor/phosis of tissue", or the so-called secondary digestion.
digestion or assimilation: the old particles, or those which served their purpose, have now become effete, and must be removed from the plant to make way for the deposition of new and life imparting matter. We have a proof of the derivation of urea, from the Metamorphosis of tissue indirectly from the fact that urea will be found in the urine, although no nitrogen elements enter into the individual's food, and it is also excreted when the animal has been fasting for some days. Another proof of the "decomposition" of the tissue yielding it results from the fact, that it is found increased after active muscular exertion - when there is increased waste of tissue. But as Ront aptly puts it, it is also derived to a small extent from that part of the nitrogenous elements of the food, which has not been rendered assimilable to the blood by the blood-forming glands, and hence must pass off as urea by the urine. But there are intermediate stages in the production of urea & from the Nitrogenous tissue which organic Chemists have lately begun
to trace. As I learn from Dr. Gregory's Organic Chemistry, which gives countenance to the belief that creatine and creatinine are intermediate bodies or are converted to a certain extent into urea, or urine acid, another are traces of both in the urine. Creatine is resolved by the action of acids into creatinine and water, and by that of base into ureidine and urea.

Uric Acid (C₄₀H₇₆N₄O₆) must next be adverted to, as being the only remaining nitro- genious substance found in the normal urine, and requires careful Consideration from its relation to some diseases. It is synonymous with citric acid, and its Composition is seen above. It exists in very small proportion in healthy urine, one grain per 1000 grains according to the analysis of Bessel, and about half that amount as given by Becquereau. We can't give any opinion as to this discrepancy. It is found in large quantity in the urine of birds and serpents, generally Combined with Ammonia. The quantity of it present varies Considerably according to the diet necessity. Thus it is diminished
by non-apatised food, and increased by an animal diet. If and lice are diminished by the use of tea and coffee as beverages with the food — but more especially by coffee, which has been found to have a remarkable influence in diminishing the 'tear and liquor' of the textures under the exercise of their functions — and thus well deserves the name of a paraprostic. It follows from this statement, that food which was adequate before, without their use, for the maintenance of the body, would be redundant, if used to the same extent along with them. On the other hand, it has been found that the use of Colchicum increases the amount of the lice and uric acid proportionately, and hence some affirm its action in feget, and rheumatic joint, by holding that these act as morbid matter, especially in joint, and ignite a paroxysm in those who are thus predisposed, and that by its removal they are alleviated. Further some aver, that the transformation from the albuminous tigers into uric acid and lice are sooner effected in them, and that Colchicinum moves the morbid sycep. Although uric
Acid is only present in small quantity, yet its determination when abnormal, frequently affords much assistance to the physician for diagnosis.

It constitutes the most frequent form of "gravel" and of Calculus, forming the latter when a nucleus is presented to it.

It may be obtained by adding to urine previously concentrated to about one half its bulk a few drops of HCl and allowing it to stand for some time (Bowman). Minute reddish crystals of the acid gradually appear, taking the colouring matters along with them. They are soluble in Aqua potable. When crystallized, they are presented to us in the form of the rhombic prism generally, but are seen in other shapes occasionally. Dr. Garrod has detected uric acid in the blood.

There is some doubt among Chemists as to the state in which it exists in urine, whether free, or in that of combination. Now Dr. Prout has shown that uric acid required 10,000 times its weight of water at 60° F. for solution, whereas in urine one part is retained only 2000 parts.
of water, adopting the analysis of Rocquenc. Consequently, inferred from this fact that it did not exist in the free state, but in combination with some base, whereby it would be rendered more soluble, and he believed that the base was ammonium carbonate, which is much more soluble viz. one part in 480 of water, while Liebig is of opinion that it is in union with soda. But this subject to fallacy, for may not the uric acid be more soluble in the urine at the temperature of the body, and also by its containing other salts?

If in union with a base, the forenamed chemists believe their assertions are corroborated by the following facts:

1. When urine is evaporated it deposits urea of ammonia, and not uric acid.
2. If mixed in combination with ammonia in the urine of birds and serpents.

Then it is in union with ammonia, it is not yet a matter of speculation, whether it exists with it in the blood, or after its secretion, but most of them believe it is in the latter. Liebig is of opinion that uric acid is formed before urea in the transformation of tissue.
and that when oxygen is admitted to it, it is resolved into ultimate products viz. urea and carbamic acid; but these are opposing facts, for birds urine is nearly all urate of ammonia, and scarcely any urea, and they are allowed to absorb much oxygen. For the foresaid conversion it requires much oxygen, which if prevented may give rise to uric acid stones or calculi. The following according to Gregory may prevent the due supply of oxygen to it:—

(1) Sedentary habits, (2) highly carbonized food, and (3) indulgence in strong wine. All of which favour its production, the first by diminishing the supply of oxygen admitted into the system, the two latter by seizing on the oxygen to the exclusion of the uric acid. But here we may be digressing.

Uric acid forms salts with the alkalies and earths, which are nearly insoluble, urate of potash being the most soluble, hence the salts of potash would theoretically be more appropriate for the treatment of uric acid stones. Hippuric acid exists in humans due to a very limited extent, but is largely
founds in that of the Cow. It also contains Nitrogen, and when benzoic acid is taken, it is discharged in the urine as hippuric acid. They are nearly allied in their Chemical Composition.

The Salts of the Urine consist of the soluble salts of the food which have entered the blood and the tissues, and when they have served their purpose, are hence discharged, and thus largely by the urine. Some of the Salts are peculiar to the urine, as the Sulphates.

An adult healthy man will discharge the soluble salts of the food by the Urine, just in proportion to their amount in the food, as in him the transformation and separation of tissue balance one another, while again the growing animal will retain more of the phosphates of his food, for the required solidification of the bones, and it has been averred that an old animal or man will give out more by his Urine than is taken in his food, in consequence of the formation of his skeleton and subsequent disintegration. Therefore by altering the soluble salts of the food, we can alter those contained in the
in the urine, and if we ascertain the one, it follows that we must know the other.

According to Reecqueil's analyses, they amount to about eight in the 1000 of urine. It is these salts, along with urea which gives the higher density to urine over water.

The Phosphates will first claim our attention, in consequence of their interest in a pathological point of view. Liebig believes that the acidity of the urine is due to the acid phosphates. Reecqueil's estimate of the daily discharge of phosphates in a healthy man is about 5 per cent. They are subject to variation from various affections of both mind and body. They exist in union with potash, soda, ammonia, lime, and magnesia. Phosphates enter largely into the elements of our food, they are obtained in the urine from the decomposition of urine—from the Metamorphosis of Various matter, and largely from the decomposition of bone as phosphate of lime.

Phosphates exist largely in the juice of flesh as \( \text{PO}_4 \cdot \text{H}_2 \) = acid, while in the blood it is an alkaline phosphate \( \text{PO}_4 \cdot \text{H}_2 \). Now the phosphates are derived from the decomposition of
of the tissues adverted to. Some Chemists were of opinion that Nervous Matter contained much phosphorus, and that when oxidised it becomes discharged into the urine, while Liebig and others aver that there is not the least shadow of evidence in favour of the brain containing free phosphorus, but in that of Na or phosphate. Any unusual mental energy or strain upon the system increases them in the urine. Jones showed that they were increased by exercise, and the alkaline ones by an animal diet.

The Sulphurates only require a few minutes in the normal exertion, and as they are not liable to any known variations, require no consideration under the head of morbid urine. They are detected in it in union with potash and soda. Some Chemists would have us believe that sulphur spirits in urine, is an indicator of the state of Sulphurate. According to Berzelius, calculation about fifteen parts of them are voided in the 24 hours. The Sulphur itself is derived from the albuminous or nitrogenous tissues, for it enters into the composition of Albumen, fibrine and Caseine, and consequently into the tissues, where it afterwards in their decomposition becomes oxidised, and hence
Sulfuric acid results, which gaining admission into the blood is discharged by the kidneys, in union with the foregoing bases. Probably the $\text{SO}_4^{2-}$ gets its soda from the alkaline phosphate of soda in the blood, or it may be from the decomposition of salt indirectly, and the potash partly from the juice of flesh as well as from the blood.

The Chlorides only consist of those of Sodium and Potassium. And they exist largely in the food, while salt is taken in addition, as a condiment. Probably some of the NaCl of the urine is derived immediately from the salt of the food, but salt furnishes principally, not primarily, soda for the bile and blood, and by dichloric acid for the gastric juice; and then these elements appear in the urine from the disintegration.

The colour of the urine is composed chiefly of the effete epithelium of the urinary passages. When urine lies at rest for some time, it will be obtained in the form of a "cloud", and the epithelium can be recognised by the microscope.

Nothing is positively ascertained of the yellow-colouring Matter, and the so-called intrinsic substance consists largely of creatine and creatinine.
Morbid Urine.

We have now arrived at that part of our subject to which we must more particularly advert, the former only being briefly discussed, and as a prelude, to the better comprehension of the present. Pathology has since the last few years made great strides in clearing up former obscurities as regards morbid conditions of the urine.

Indeed such is the degree of perfection, at which this has now arrived that we can, by the mere examining of patients affected with certain diseases nearly arrive at a just diagnosis of their disease, and prognosticate accordingly as in Albuminuria, Diabetes Mellitus.

"You have heard, probably, of the quacks, who call themselves "water doctors," and who pretend that, by mere inspection of the urine of a patient living at a distance, they can tell what is the matter with him, and how he may be cured. This skill which looks like Conjuring, the secon table physician of the present day does really possess." Watson.

And it is now by advances in Chemistry and Physiology.
physiology and pathology that the study of disease will be successfully prosecuted; for they must go hand in hand, ere we can arrive at a more perfect conception of certain diseased conditions of the body, and more especially in connection with our subject. Within the last few years this is evidenced by the numerous excellent monographs which have appeared in connection with our subject. We can only at present animadvert to its principal morbide states, and even these briefly, as otherwise it would make the paper too extensive.

Urine passed during a diseased condition of the body, is more or less altered in its composition and physical properties.

We may in the first place consider the species of elimination of urea in the urine, and first of its type.

Urine containing an excess of urea is characterized by its high specific gravity, its greater acidity, and more contracted, and thus precipitates more readily with N₂O₅. Urea in health according to Bocquelin's tables averages about 14 parts in the 1000 of urine, while in disease it often rises to 30. We have already seen that Chemists are
by no means agreed as to the amount of urea in healthy urine, but I have only entered the above fig.
ures for illustrating the ratio.
Urea in excess may be either absolute or relative. 
An absolute excess is observed in some affections of the diseases.
Prout has shown to the profession that excess of
urea often coexists with some cases of hyperuricuria,
that it is the former which mainly occasions the high density in uricuric urine, and that probably
both these morbid states are produced by the
same morbid influence interfering with digestion and the secondary assimilation.
Certain cases of hyperuricuria with excess of
urea are very emaciated, and the most plausible
explanation of it, we can offer is, that there is an
unusually rapid transformation of tissue-Caused by some morbid influence.
Urea is found in excess with diuretics as in one of the forms of polydipsia, but here
the quantity of urea in a certain quantity of urine may be less than in health; this form
of it is technically called diuretic acid, and is very
apt to pass into diabetes mellitus. It occurs
chiefly...
chiefly among the children of the poor. We must draw a distinction between the excess of urea constituting disease, and the relative increase of it arising from indulgence or plethora. When it is in excess it acts as a slight diuretic.

Proust mentions in his work that he has found excess of urea associated with certain cases of hydrophobia, and some other nervous affections.

As formerly observed, urea is increased by an animal diet, and it is avoided by the use of Colchicum. An eminence when speaking of the physiology of urea may be supplied here. That the quantity of urea secreted in a certain time is a measure of the amount of the tear and wear of the tissues of the body. It is calculated that an adult man, discharges on a daily average about 460 grains of urea, and it has been proposed to record the daily excretion of urea in health and disease.

We shall now direct our attention briefly to the deficiency of urea in the urine.

Urea is deficient in another form or variety of polyphasia, while the aqueous ingredient is in excess to this form of diabetes insipidus.
Dr. Willis gave the name anururia, and there remains a third form of it, in which there is simply
an excess of the watery part,—aqueous urine, and
which has the dignified appellation of hydruria.
Proust mentions that in certain cases of anururia,
there was a relative diminution of urea to the other
ingredients,—and not merely impure urine.
But diminution of urea in the foresaid in-
stances is not nearly so marked as in the
following viz. Bright's disease, and Cholera,
according to Bowman.
In Bright's disease at last, the urea is very
much retained in the blood, on account of the im-
perfect eliminating power of the kidneys, and
is supposed to give rise to the Coma or Convulsions
(as Carbonate of Ammonia does when injected) which
supervene, by being decomposed into Carbonate
of Ammonia. Urea is found in large quantity
in the urine, when the individual subsists largely
on farinaceous food, and as already noticed,
coffee is supposed— and even proven by
Latham's experiments, to diminish the "ear &
wear" of the textures to a certain extent, and
hence there will be a slight diminution of
urea.
area proportionally. Area is diminished by an insufficient supply of Oxygen - whatever that may depend on, to convert the insoluble urine acid into soluble urea, and other ultimate products, according to Liebig.

In Bright's disease in some instances urea has been found to a very small extent in the sweat, or taken there acting vicariously of the kidney as it would appear, and it has been detected as we have seen in a case or two, in the serum of a blistered surface for such affections. Sometimes the excreta of urine in the blood - along with a little increase of the salts, especially the Chlorides in Morbus Brightii may irritate certain textures, as the serous membranes of the lungs, or the mucous membrane of the bowels, giving to pleuritis on the one hand, and diarrhoea on the other, and thus so far causing its own elimination, and warding off the evil day for a time.

But urea is altogether absent, as well as the other urinary ingredients in suppression of urine - from whatever cause, which proves fatal in a few days unless the secretion is restored. And as I learned from Prof. Henderson last Winter.
that there is often a vicarious secretion of urine in hysterical females from the capillae mammae, or it may take place from other parts, as the external ear, ends of the nails, etc., otherwise just as in vicarious menstruation.

Coma is induced very soon (by the urea) in ischuria renalis, and it is believed to result from the retained urea, or after being decomposed into carbonate of ammonia, thus acting as a narcotic poison on the nervous centres. It is not fully proven that the urea when this retained is decomposed into carbonate of ammonia, for it now appears that a small quantity of ammonia is normally evolved with the breath.

We purpose now to make a few remarks on the abnormal proportions of uric acid and the urates in the urine.

Our comments here can be much curtailed as we have spoken largely of the physiological relations of uric acid. When urine contains an excess of the said acid, it has generally a higher colour than the normal secretion. If the so is casually about the same, unless there be an excess...
of urea. When present in excess, it is deposited as the urine cools, for this acid is more soluble in warm than cold water, and the less solubility of it at a lower temperature is supposed by some, the reason of the greater frequency of calculi among children. Also it is thought that the phosphates are in diminished quantity in their urine—owing to their deposition in the bones, and as Liebig avers that they are the solvents of the uric acid. But uric acid or its salts may be deposited from other causes irrespective of unusual quantity, as from the presence of another free acid diluting the uric acid, or from too little water (kid). The deposited lithrates are often mixed up with sermon, and other matters.

The primary form of uric acid, as the water under the microscope is the rhomboic prism, or some modification of it. Deposits of uric acid or its salts are soluble in a solution of caustic potash, and both these tests distinguish them. Uric acid in excess in the urine, or as a deposit therein may attend on trivial derangement of the health, or a more serious one. They are most frequently met with in those of
of the arthritic diathesis, as there is an increase of uric acid generated in them, and must therefore be discharged. Some were of opinion that the excessive generation of uric acid in them has the cause of the paroxysm in part, and that Colchicum caused the morbid excess to disappear, and no longer excite the system, and they thus explained its action.

But we must go beyond this explanation, for others living under the same circumstances and conditions have not this excess, and the only rational explanation we think is, that there must be some inherent difference in the constitution—which we are unable to ascertain, and which disposes to the increase of uric acid in them. The excess—if it excite the paroxysm, only the result of this minute innate state of the body.

A trifling disorder of digestion may cause a deposit, hectic fever, certain inflammations, habitual indulgence in much animal food, with too little exercise, indulgence in spirits, the want of attention to the maintenance of the functions of the skin, or by certain diseases of which prevent elimination, and cold. These are all liable to give rise to it, and as already observed.
observed, the presence of another free acid, as also a lowered temperature, and deficient water in the urine may also cause its deposit, irrespective of it being in cycb.

Such urine is unusually acid, and of a rather higher density. When passed it is clear, but on cooling the sediment is deposited more or less abundantly. Uric acid or the urates are deposited in two principal forms — the amorphous and crystallised. The former is observed of different colours, but chiefly of three, viz. red, pink, and yellow.

Let us first endeavour to treat briefly of the Amorphous one, and its varieties according to colour.

It consists principally of uric acid in combination with carbonate of ammonia.

The red, or so-called, latexitious or brick-red sediment consists of urate of ammonia with some urate of soda, and colouring matter of the urine, along with some red colouring principle.

The amorphous red sediment is usually found in connection with some febrile, or inflammatory affection of the system. The increase of uric acid in inflammations was supposed by some observers
observers to be due to the increase of fibrine in the blood, but we now know that the said acid is increased in certain cases of state irrespective of fibrine, and is probably due to the increased rapidity of the transformation of some protein compound in the secondary digestion.

The first one consists of urate of ammonia, otherwise with nearly the absence of the peculiar colouring principles of the urine, and the colour is supposed by Plaut to be due to the precipitate of ammonia. This is the usual form, and is said to be met with chiefly in hectic fever, and certain affections of the liver. The yellow one is composed of urate of ammonia, coloured more or less by the yellow pigment of the urine, and occurs principally in non-fibril states of the system, and generally with some transitory affection of digestion.

The crystallised sediment or red gravel, consists of nearly pure uric acid, and when examined microscopically, is seen to have the form of the rhombic prism, while the amorphous one, is observed chiefly in the form of molecules, or globular或several. It is sometimes precipitated from
from the urine in a crystallised and nearly pure state, and varies in appearance and colour according to circumstances. The term "gravel" is generally applied to the passive of the uric acid deposit; it is liable to evaporations, and such intensities are termed "fits of the gravel." Individuals after the age of forty, and children are the most subject to this deposit or "gravel.

The amorphous deposits are said to be more frequently observed than the uric acid "gravel," and are not deposited till the urine cools. They disappear again when it is subjected to heat, whereas the uric acid "gravel" does not act so under similar circumstances. The amorphous sediments appear as a crust also on the side of the vessel wherein contained — hence the name latrine stone deposit, and they render the whole of the urine turbid when it is shaken; whilst uric acid gravitates when the vessel is turned to one side, and further the transparency of the fluid is not interfered with.

But for the more perfect discrimination, as formerly observed, we should have recourse to the microscope, and anatase potash.
Abnormal Proportion of the Phosphates.

The normal amount of phosphates in the urine is about one grain per 1000 of urine, but in disease it varies from a scarcely perceptible trace to about 5 per 1000 according to Bouman. When present in excess, they may generally be partially precipitated by warming the urine, and this precipitate is dissolved by N\textsubscript{2}O\textsubscript{3} which distinguishes it from albumen.

And first as to their deposition from whatever cause. The deposit of phosphates is commonly called "white gravel", and also phosphatic diathesis. This latter term does not imply their excess in the urine, but their appearance in that solution in a visible form, or in other words their deposit. Dr. R. Jones has shown that their appearance has been wrongly assumed to denote their presence in excess. There may be a deposition of the phosphates, or an excessive amount of them in the sediment, irrespective of their usual amount in the urine. This may result from changes in the urine, from disease in certain parts, or from disorder of the acid holding them in solution.
The earthy phosphates are found to be in greatest abundance after a meal, and more after the use of vegetable than animal food. The phosphatic deposit is usually white, or pale gray; it may be precipitated in the form of gravel, or it may be suspended in a cloud resembling that of mucous, or it may form a particle on the surface which is sometimes iridescent. And first as to the characters of such mine. It is generally pale and copious, of low density, occasionally alkaline when excited, never more than faintly acid; often turbid, and that last discharged presenting a milky appearance. Sometimes it emits an unpleasant odor, or like that of broth, and frequently is ammonia-cal from the first, dark colored, and loaded with mucous, or blood, &c. It very soon undergoes putrefaction; and hence we have an offensive odour and a copious deposit. Mine which is alkaline from Carbonate of Ammonia is called Ammoniacal Mine, and indicates the so-called phosphatic diathesis of Deunt. Mine may be alkaline from a fixed alkali, and then phosphate of lime falls.
falls as a fine white powder, and not the triple phosphate which is caused by Ammonia. In the former case the urine is secreted alkaline while in the latter it results from decomposition. They are observable if the urine become any how alkaline, and are not obvious in normal urine as they are soluble therein. When healthy urine passes into the state of decomposition, from some disorder in the urinary passages primarily, or secondarily from injury of the Spinal Cord, the mucous membrane of the Bladder becomes diseased, and then pours forth unhealthful mucus which contains animal matter, and then acting as a ferment to the urine decomposes into NH₃ and CO₂, and hence the urine becomes alkaline, then a deposit of phosphate results. For it is incompatible for the phosphate then to remain in their state and combination. The precipitate may be either amorphous or crystalline, the former consisting of phosphate of lime; the latter of the so-called triple phosphate of Ammonia and magnesia. This last is observed under the microscope to be crystallised in the form of triangular prisms.
prisms sometimes truncated, and coloniform, but the anhydrites, and they vary according to the case. My deposits the phosphates, which are insoluble in aqua potassa, and are thus also distinguished from the nitrate.

The phosphatic granule is not prone to cohere within the bladder, unless there be a calculus present.

The tendency to alkalisation of the urine from fixed alkali, and hence to phosphatic deposits, is accompanied by general debility, and is indicative of the health falling below fair. Those who are overwrought, whose mental powers are depressed from whatever cause, and those who indulge much in venery are all apt to discharge urine which is alkaline, or only faintly acid, and hence there is a tendency to the deposition of phosphates. As origin from the unhealthy condition has been referred to. But there are certain states of the system, in which the phosphates are found in excess in the urine, as in inflammatory affections of the brain, and certain kinds of delirium (not D. Remens). There is an excess of earthy phosphate in the urine when the hapless patient is labouring under Mollities opium.
There are two conditions in which the phosphate may be found in less than the normal amount, viz., in hypertrophia of the skeleton and in pregnancy, when these an abnormes for uterine purposes.

This concludes our remarks on disorders of the Phosphates, and we shall next consider variations in the Chlorides present in the urine.

We are not aware of any condition in which they have been detected in increased amount, and when hydrochloric acid is taken, it does not appear in the urine as such. The Chlorides have been found defective, or altogether absent in pleuritis and pneumonia. This depends on these salines being effused along with albumen from the blood, but why should not this happen in other effusions, or inflammations? Their presence in the urine is detected by adding a drop of Mg to the urine in a test tube, and then dropping into it a little of the solution of nitrate of silver, when a white cloudy precipitate is at once formed—if they are present.

It has been said that the Chlorides are absent in
in severe cases of variola, but we have not been able to verify this opinion, in our examination of the urine of a few variolous patients in the Infirmary. Very probably they have been found absent in such patients — if at all, when there was some intercurrent pneumonia present in addition, and not detected.

A priori it would appear that those who subsist much, and for a long time on salted animal food (which may ultimately give rise to scarlets, but this disease may arise from various causes) would be more liable to have the chlorides in greater abundance in the urine than the normal amount. But so far as we are aware, this has not been enquired into, and it is very difficult to make quantitative examinations of the urine, entailing a good knowledge of chemistry and certainty of manipulation.

Urine containing an excess of mucus is generally alkaline very soon, but it may be neutral, or slightly acid when papiled; at all events it very soon becomes alkaline or ammoniacal, on account of the excess of the
in stable and unhealthful (mucus excracted a yellowish, mucus) change in the body by virtue of the cachexy, or some vitiated force, by which the elements of urine with those of water are made to assume new arrangement (W.) These changes have been observed when heating of phosphatic urine.

Urine containing an excess of mucus, is generally met with in an irritated or inflamed state of the genito-urinary mucous membranes, which may be excited by any variety of causes. Such urine is generally found mixed with a considerable quantity of phosphate. In this case, it is sometimes liable to the precipitation for salts in the urine, but may be distinguished from that containing pus, by its deposit being dry and tenacious, by the microscope more intensely and also by its not giving any indication of albumen when tested with heat and N₂O₅ as with the urine of the Bowmen.

When mucus is very abundant in it (Bowman states that) it is coagulated by acetic acid. little or nothing is positively known concerning the structure and colouring matters, more than has been said, and we can observe anything of them.
Having thus briefly adverted to this division of our subject, as far as our time and space would permit, yet not without being sensible of the very imperfect manner in which it was treated, we must next pass to the consideration of urine containing substances which are not peculiar to the normal secretion.

We may prosecute this section, just as enumerated in the outset.

I And first of albumen in the urine, which imperatively demands our attention from its frequency and importance. It is not our intention to speak of the pathology of the various forms of Bright's disease, but merely of urine containing albumen generally.

Albuminous urine—in Bright's disease contains less urea, as well as the other salts relatively. It was at one time held that the increase of albumen was vicarious of urea, but this however is no longer believed in, and is proved not to be the case. We may first speak of albumen in the urine, and the tests by which it is recognized therein. Albuminous urine varies in physical properties.
properties; it may be alkaline, acid, or neutral, and is generally of a low density, but it can be detected by any description of it, only because it is had to chemical tests. Its amount may vary from a trace up to about twelve parts per 1000 (of urine). Albumen coagulates about 160° F. and hence we ascertain its presence in the urine by heating the latter to the boiling point, but this means alone is subject to many fallacies to which we shall by and by refer. If the urine be too near from steep ofzuurs, the latter may be separated from it by filtering it, before the application of the tests.

"Albumen in the urine is precipitated by Na₂ & HCl, but not by phosphoric, acetic, or tartaric acids, which indeed appear to exercise a decided solubel action on it, and when present prevent its coagulating on the application of heat. A portion of the suspected urine should be tested in a clean test tube, and then heated by a spirit-lamp, when if albumen be present, a whitish cloud will form which will gradually subside to the lower part of the tube; its amount will be in proportion to the amount
of albumen contained in it, varying from a
more tarry to a thick coagulum. If this he not
disintegrated by N\textsubscript{2}O\textsubscript{5}, we may rely on it that al-
bumen is present. Then if urine become opaque
by heat and by N\textsubscript{2}O\textsubscript{5}, it is quite indicative of
the presence of albumen without further tests.
But it is important to recollect that certain
fallacies may occur, if only one of these tests be
used:

a. Heat alone will produce a white precipi-
tate in urine containing an excess of phosphate,
but this precipitate is distinguished from albumen
by disappearing on the addition of N\textsubscript{2}O\textsubscript{5}, which
instantly dissolves it.

b. Again N\textsubscript{2}O\textsubscript{5} alone often throws down a pre-
cipitate of uric acid or urates when in excess,
(or urea, and then the white nitrate of urea formed).

But when the criterion of heat is used in
addition, this precipitate by N\textsubscript{2}O\textsubscript{5} will disappear
while coagulated albumen would remain insoluble.

C. Albumen may be present in urine, and not
be precipitated by heat, provided the urine is
alkaline. If urine thus suspected to contain
albumen be alkaline, or restless to a blue

Colour
colour reddens litmus paper, &c., NO₃ must be added to the fluid before the application of heat.

2. Albumen may be present, and yet escape detection from using test-tubes which are not scrupulously clean from any of the acids already mentioned which are said to prevent the coagulation of albumen by heat.

3. We must also bear in mind that when only a small quantity of albumen is contained in it, excess of NO₃ will redissolve it, and we may hence infer that the precipitate was composed of phosphates; and again an insufficient quantity of the said acid may form a definite compound with the albumen, so that the precipitate will result when it is heated (Watson).

If both heat & NO₃ in the proper proportion cause a white precipitate or coagulum, there can be no doubt that albumen is present.

Bearing in remembrance the preceding fallacies, without having recourse to creosote, tannin, dichloride of mercury, which are liable to fallacies also, and not so easily applied, the persistence of albumen in the urine is indicative of Bright's disease of the kidneys, yet
may be absent in it occasionally, but will happen.
And this opinion is certainly corroborated if
casts of the urinary tubules are observable
under the microscope. But a slightly coagul-
able state of the urine may exist in health, as well as
in some diseases—other than that mentioned.

Errors of diet, as from eating pastry largely,
or cheese in abundance has caused coagulability
of the urine for a time. Albumen of hog injected
into the blood of an animal, will soon be found
in the urine, which will hence coagulate by heat and
no—which might lead to a mistake, if it
was seen in men suffering Bright's disease.

Albumen has been observed in the urine by
Beaugez in Scarlatina; in Syphilitics by Lehmam,
in Variola and typhoid fever by Solow; in
Cholera by Heller; in tubercular disease in and
mechanical Congestion of the Kidneys, as well as
after blisters, and certain diseases. It
has also been witnessed by Beaugez in pneu-
monia, and by Heller in pleurisy—in all
the above affections according to Prof. Henderson.
But we presume it is not found very largely
in the foresaid diseases, and again is not persistent,
which
which state this characterises morbus Brightii, and also there will be an absence of casts in the said urine, which were ten present in the latter.

So much for the urine containing albumen, and the appearance of sugar in the said excretion. I will call for a few remarks on the appearance of the urine itself, and its diagnostic tests, and not on the causes of its appearance therein.

It is grape (or diabetic) sugar (C₁₂H₂₂O₁₁) which is thus present in the urine as an abnormal ingredient. The proportion of diabetic sugar in it may vary from a mere trace to from 50 to 80 parts in the 1000 parts. Diabetic urine is generally light coloured and transparent, of a pale straw, or greenish colour, and very copious in quantity. Its odour is peculiar, and resembles somewhat that of sweet hay, or new milk according to Dunitz. Its taste is more or less sweet, and the urine is of a density ranging from 1020 to 1055, about 1030 to 1045 being the most common.

The presence of sugar in the urine is recognised by analysis, but more simply by the application of chemical tests, which will serve for all practical purposes. We shall only detail
1. Moore's test. Consists in boiling a portion of the suspected urine in a test tube, with about half the amount of aqua potassa, when if diabetic sugar be present in it, the liquid will assume a Brownish Colour.

2. Frowen's test is thus performed. Add to the suspected urine in a test tube, a few drops of an solution of sulphate of Copper, then add aqua potassa in quantity equal to about half the urine employed, when a pale blue precipitate of hydrated oxide of Copper falls, which is redispersed in the excess of alkali. When this is heated to the boiling point, a Yellowish-red precipitate of suboxide of Copper falls, which is quite indicative of Sugar. The said tests are amply sufficient, without any additional, but we may just mention another—If we wish to corroborate the former one, and it is right that we should be conversant with it viz. the Fermentation test.

3. Fermentation test. This is capable of detecting sugar in the in very minute quantity, by the operation of yeast on the sugar. Insert a test-tube filled with urine to which
a little yeast has been added, into a vessel which also contains urine. Then this should be placed in a
warm room. If sugar be contained in it, it will soon undergo the curious fermentation, and the Carbonic acid
rising in the tube, will deface the upper surface of the
wine. We need do no thing more than mention the
remaining tests viz. Mauvemus, Pettitkefer's, and that
affected by the growth of Souchae.
Sugar in the urine in large quantity is a characteristic
or pathognomonic sign of Diabetes Mellitus, but in
our notes from Prof. Henderson's lectures, we find
the following: - That sugar is detected in the urine
(in small quantity) in other states of the system
besides diabetes; as in those subjected to leucæthia
in rabbits, which were prevented from breathing.
Sugar was also discovered in the urine of phthisical
patients-treatec by the Carbonate of Iron (probably
the saccharine), and that Pep. discovered it in the
urine to a small extent in those suffering from
pleursy and Asthma, and he explained it by the
respiration being impeded; and that the glucose
was not sufficiently in the lungs. He found
it also in some cases of hysterics and epilepsy.
And it is said that the urine of old persons
contains
Traces of Sugar. Sugar has been noticed by Kirsten in certain cases of gout, and we have heard that injuries or burns about the head, especially, as also that furunculoid diseases of the skin give rise to traces of sugar in the urine. And we were informed that the urine first voided by infants contained a trace of Animal Sugar.

In the forenamed instances, we presume it is only found in a limited quantity, and is only temporary or amenable to treatment, while in diabetes, it is met with in bulk, and is very intolerable. It has been lately noticed that this diabetic sugar differs slightly in some chemical properties from cane sugar, and it would be more correct to call it Animal Sugar, as it is produced in the animal organism.

III. Urine may contain Blood, and we ought to be able to recognize its presence therein. The urine thus displays different appearances, according to the fact of the general urinary passages whence it is derived, and by this along with other means, the physician can ascertain probably whence its source. Hematuria may owe its origin to various causes, on which we shall not...
not enter, but rather in the appearance, and detection of blood in the urine. Urine containing blood has a red, brown, or it may be a dark tinge, but many substances taken internally, will produce the same colour, as we purpose alluding to them hereafter.

If urine contain blood, the presence of the latter is recognized by raising the fluid to the boiling temperature, and adding N₂O₃, as already described for albumen. When a coagulum of a brown or red colour will make its appearance; the colouring matter of the blood give this tinge to the coagulum, instead of the white obtained from albumen alone. But the best criterion is the microscope, for if there be any blood present in the urine, there must be blood corpuscles which will be readily recognised under the microscope, either in a turgid or collapsed condition. When the urine contain blood, the latter often subsides to the bottom, and destroys the transparency of the liquid, which will not take place if the blood colour arise from colouring matters, and should any sediment take place in the latter case, it is dissolved by heat, but not so with blood. Strong ammonia
imparts a violet tint to Colouring matters, but does not alter blood. Bloody wine communicates a red stain to linen after immersion in the fluid. Dr. Watson points out how urine may be red, or dark, circumscribing the presence of blood in it, from the use of certain substances as food, or remedies, as from the prickly pear, beet root, madder, liquorice, gamboge &c. But the presence of blood is certainly detected by the tests before mentioned.

**II. Bile is another Animal Matter, which is liable to be occasionally present in urine. This happens when the bilary organs are de-ranged, from whatever Cause, when the bile is not eliminated from the liver, in dilution or from the blood, as it is supposed, in suppression, the blood then becomes charged with it, and hence it is eliminated by the Kidneys as one secretory channel. When Bile is present in urine, it communicates a yellowish brown, or a deep brown colour to the liquid. But as formerly noticed, bilary matter in the urine, and collected in a deep receptacle may appear nearly black, this is merely a Concentration of yellow, but when much diluted, it will show...**
its yellow hue. Its presence in the urine may be detected by the application of the following tests:

1. Pour on a white plate a small quantity of the suspected urine, to which add a few drops of NO₃, which, if biliary ingredients be present, will turn it first green, then blue, violet, red, and finally yellow. Gregory, but the green and the yellow are the most observable.

2. The next we shall mention, is that known as Pettenkofer's test for bile. Put the albumen urine so tested must contain no albumen. It consists in adding nearly an equal quantity of sulphuric acid to the suspected urine, and then introducing some grape or diabetic sugar, when if bile be present, there will be produced a fine, but transient purple colour. And conversely, this would constitute a good test for diabetic urine.

3. Dr. Bird enumerates another Heller's, which consists in adding some albumen to the urine, and then evaporating when the precipitated albumen will be yellow green, or blue if bile be present.

We have found the first mentioned the most convenient, and it will suffice along with the
Theodore Ziegelein is also met with in the urine, as an abnormal or mineral element of the uriniferous secretion. Muckle was the first to point out that this substance was found in the urine of pregnant women. When such urine stands at rest for a few days, a pellicle of fatty-like matter rises to the surface, and remains there for a few days, which as the urine becomes ammoniacal breaks up into particles, and then subside to the bottom, which thus distinguished from other morbid states of the urine.

Dr. Reid has made some experiments with it, and showed that when examined under the microscope, the pellicle consists of granular particles, often mixed with some prismatic crystals of the triple phosphate, and of a few globules of fatty matter. It appears to be more or less a caseous fluid.

He was of opinion that it resulted from the mammary eliminating this fluid from the blood, and then not being discharged from them, it was received back into the blood, to be thence secreted from the body by the kidneys. This is not considered a pathognomonic sign of pregnancy.
But it is important along with others for corroborating the diagnosis.

VI. Urine containing fat, or “chylous” matter.

Such urine is more of a milky, fatty, and turbid appearance. After standing for some time, it sometimes “gelatinises.” Fatty particles are occasionally contained in it, under various circumstances, they are detected by the microscope, and by being dissolved by ether. Substances also possessing the characters of chyle (according to Dr. Bird) have been observed in it also (as well as the so called tritogene of protein by Fourt), they are not solvable in ether, and they gelatinise. It is very rare in this country, but is more frequent among negroes, as we learn from Fourt’s work.

But so called “fatty urine” has only contained fat sometimes, and if not examined it might have been mistaken for fatty urine.

Hysteric females sometimes may add fat, or milk to their urine (or even have the presumption to inject either of them into the bladder), in order to deceive their physician, so that we would require to be on our guard. — The urine may occasionally appear fatty from the
the epithelium of the urinary tubule having undergone the "putty degeneration," and then disorganized, so that they render the urine turbid. But they can easily be detected by the microscope, when the scales will be obvious, and seen to contain oil globules, while albumen in the urine will be present in addition.

The Causes of Chylous urine are imperfectly understood. B. Prout attributes it to some disorder in the organs of assimilation, or in the functions of the kidneys, or both.

VII. Urine Containing Pus as an abnormal ingredient. Pus may gain its way into the urine from suppuration in the kidney, or in some part of the genital-urinary mucous membrane, or from the eruption of purulent deposits from the tissues surrounding the urinary passages into them.

Urine Containing pus is met with generally acid, or neutral, but sometimes alkaline. When left at rest, a pale greenish yellow layer forms at the bottom of the fluid, and not blunting the fluid turbid like an Imp of Mucus (unless the urine is alkaline).
The urine is generally light-colored, or milky. If agitated, the sediment which takes place becomes diffused through the liquid, and again subsides.

Pus in the urine is detected by having recourse to chemical tests, and to the microscope pre-eminent. If some urine with pus in it is mixed with Caustic potash solution, a dense gelatinous mass is formed. There is also some albumen in it, which is rendered slightly coagulable by heat and acids, as already mentioned when speaking of the discrimination between pus and mucus in the urine.

Pus also gives traces of fat when mixed with ether, but it is more certainly detected by the microscope, when the globular pus corpuscles will be obvious till they become more discernible by adding a drop of nitric acid to them, when their nuclei (generally three) will be rendered distinct.

VIII. Urine Containing Spermatozoids.

The urine in such a state may present its usual physical characters, or it may contain a 'cloud' and such urine sometimes proffers the characteristic odour of the seminal fluid. They can only be certainly detected by the
the microscope. Brownin states that they are never found in an active state in the urine. They are oval in form in man, with a more or less tapering tail.

Dr. Bird remarks that oxalate of lime was often noticed by some observers to be present in such urine. He does not however acquire altogether with them, that this statement would appear probable, from the frequently accompanying dyspepsia (hyperchondriasis), and also from the fact of its being often observed by others.

IX. Urine Containing Oxalate of Lime (C₂O₃ + 2H₂O)

Such urine is most unusual in certain persons. It is of a deep red, rather above the normal standard, and as already observed, fever, and the urine are found increased in some cases of it. It is always acid, unless a calculus of it forms in the papilae, and then specific diseases action there, rendering it alkaline.

The colour of the urine is that of amber, but more frequently of a greenish tinge, and often contains more epithelium. It frequently is a concomitant of the presence of spermatozoïds in it, as mentioned above, and both
may be owing to the same Cause as Cancer, as "disorder of the system," dyspepsia (hypochondriasis), nervous insubility &c., or these may accompany it presence.

Dr. Reid, was the first to point out that it appears in the urine in the form of Crystals of the octahedral form (when the urine cools, but these crystals have been detected in the blood by Carrot), but occasionally in that of the "dumb-bell". It was known before in the form of Calcius (Mulberry).

The Crystals are recognised by the microscope after the urine stands at rest for some time, and have the form mentioned above. Dr. Reid mentions that when they occur in the dumb-bell form they consist probably of the oxalate of lime, and are highly refractive.

Lime is present to a small extent in normal urine, and probably is increased by the use of hard water, hence when oxalic acid gains admittance into the urine, it unites with it, in virtue of its great affinity for the salts of lime.

Its pathological origin is not altogether settled, but the following are the speculations regarding it:

1. According to Prout, it was due to the mal-
apimilation of saccharine elements.

3. Bid, Willis, et al. trace the derivation of oxalic acid to disorder in the "metamorphosis of urine" and as thus derivable from tissue and also to the anal assimilation of food.

3. Lübig states as his opinion that it results from urine being oxidised into oxalic acid, and he shows by chemical formulae how this can take place. Further that guano, which is composed largely of urate of ammonia, has this salt replaced by oxalate of ammonia by time, and this he thinks corroborates his view.

4. Lehmann has met with oxalate of lime in the urine coincident with chronic effects of the respiratory organs, and he is of opinion that there there is a deficiency of oxygen to convert all the Carbon into Carbonic acid, and that some oxalic acid is formed and requires an atom less of oxygen than Carbonic acid.

But oxalic acid is found in the urine occasionally — irrespective of the foregoing causes from the use of tobacco and coffee. Hence, we should make enquiring after this source of accidental origin.

X. Urine Containing Cystine (C₆H₁₄O₄S)
Such urine is somewhat of a dark yellow, inclining to a green colour, has an odour not generic, and it has been said that Urea and the urates are diminished in it. It is of very rare occurrence in the urine, but when present it is said to be easily recognised, as it is always crystalline, and is dissolved by Ammonia, and on evaporation is again deposited in the crystalline form. Under the microscope it appears in the form of hexagonal plates, often overlapping each other.

Its origin is rather obscure, but it seems probable that it is due to some disorder in the "metamorphosis of urine," for the albuminous tissues contain all the elements for its formation.

Dr. Prout expressed as his opinion, that it was somewhat connected with fatty liver, and he has observed fatty matter in such urine also. This may be the case in some instances, and we know that Cholic acid and tannin of the bile also contain a large amount of sulphur, and if the fatty liver cannot eliminate these properly, then some other compounds may be formed as Cystine, and thus be discharged with the urine. Dr. Reid believed it to be connected with a
XII.

Urine Containing Uric or Xanthic Oxide.

This acid is constitutional to uric acid, its presence in the urine is exceptionally rare, and when present it may form a calculus. So little is known about it, and the reasons of its appearance, that it would only be transcribing were we to say anything more on it.

These are the principal abnormal ingredients occurring in the urine, generated within the system, and not introduced into the body.

But substances or ingredients not peculiar to the normal secretion, may be present in it, when such have been taken as remedies, and as noticed already some of them might be mistaken easily to test for blood in the urine.

1. Certain substances appear in it unchanged as the vegetable colouring principles, and we need not refer to them again, most salts of the inorganic acids &c. Indigo has found its way into the urine, either from being taken as a remedy for epilepsy, or from being administered in wine.

Great we come with the latter statement. Here the urine...
has a bluish colour; we need not discuss its chemical relations. Dr. Carter in the R. Infirmary has shown as specimens of morbid urine - containing bodies produced in the system (do more)

2. Certain substances undergo a change, before they arrive at, or in the urine itself. Checks it, away the recognised therein, such as iodine, the vegetable acids, neutral salts of the latter, benzoic acid. We observe the changes which take place in the two latter already.

Iodine and its compounds have their iodine converted into hydrobromic acid in the urine, and the latter generally in union with soda or ammonia, and therefore before its presence can be detected there-in, an acid or chlorine must be added to the liquid to disengage the iodine, when it will give its characteristic blue to solution of starch.

Any compound of iodine gives indication of its presence very soon - at most a few hours. And any metallic preparation taken medicinally - such as Arsenic, iron, lead - has been detected in the urine - in some combination, in limited amount.

Various odoriferous vegetable principles...
introduced into the system, are also detected in
the urine, either in a changed, or unchanged
condition, as the characteristic odour of Iodine
from the use of Turpentine.

We might next enter upon a Consideration
of Urinary Calculi, but as our paper has already
come up to, if not exceeded, the ordinary limits,
section and as we consider this as not properly
belonging to our subject, we shall not
enter upon a Consideration thereof.