fibrine, which Andral and Gavarret were the first to show accompanied true inflammations. From the blood it is again separated by the glands in various forms, constituting those critical discharges and sediments which accurate observers, since the days of Hippocrates, have been in the habit of considering signs of the disappearance of disease.

It frequently happens that the whole exudation is not thus got rid of. Part of it undergoes transformations, whereby it is changed and formed into permanent tissue. This second mode, in which the exudation is developed, we shall next proceed to consider.

(To be continued.)

Part Second.

REVIEWS.

1. Animal Chemistry, with reference to the Physiology and Pathology of Man. By Dr J. Franz Simon. Translated and edited by George E. Day, M.A. and L.M., Cantab.; Licentiate of the Royal College of Physicians. 2 vols. 8vo. London: 1845-6. Printed for the Sydenham Society.

2. Dr Day's Reports on the Progress of Animal Chemistry. In Ranking's Half Yearly Abstract of the Medical Sciences. 1845-6.

3. On the Analysis of the Blood and Urine in Health and Disease; and on the Treatment of Urinary Diseases. By G. Owen Rees, M.D., F.R.S., F.G.S., &c. Second Edition. London: 1845.

4. A Practical Manual, containing a description of the General, Chemical, and Microscopical Characters of the Blood and Secretions of the Human Body. By John William Griffith, M.D., F.L.S., London: 1846.

5. The article "Blood," in Copland's Dictionary of Practical Medicine. Vol, 1. London: 1844.

Animal Chemistry is a branch of science, in the progress of which medical practitioners must feel deeply interested. It is true that every professional man cannot be expected to cultivate it practically, but the results arrived at, as they tend to influence his notions concerning the nature and treatment of disease, demand his most careful attention. We cannot remain silent on a subject so truly important, and therefore propose, in the present article, to
present our readers with a concise sketch of the present state of chemistry in its relations to physiology and pathology.

The English version of Dr Simon's work which has appeared under the auspices of the Sydenham Society, is far from being a mere translation of the "Physiologische und Pathologische Anthropochemie," published in 1842. Dr Day has written an introduction, extending over eighty-six pages, "with the view of facilitating the perusal of the work to those who have not paid much attention to the recent progress of organic chemistry," and has incorporated a large amount of additional matter. In point of fact, several of the chapters in the second volume are almost entirely from the pen of the editor.

Dr Day has divided the "Animal Chemistry" into an introduction, thirteen chapters, and two appendices.

The introduction embraces the consideration of the proximate constituents of the animal body and of the secretions. The first chapter is devoted to "the proximate analysis of compound animal substances;" the second, extending over 260 pages, to the blood, lymph, and chyle; the third, to the secretions of the chylopoietic viscera and the theory of digestion; the fourth, to the milk; the fifth and sixth, to the secretions of mucous membranes and of the external skin; the seventh, extending over 240 pages, to the urine; the eighth, to the secretion of the lachrymal, Meibomian, and ceruminous glands; the ninth, to the secretions and fluids of the generative organs; the tenth, to the intestinal excretions; the eleventh, to the component parts of the animal body; the twelfth, to solid morbid products; and the thirteenth, to the fluid products of disease. The first appendix contains the results of the analyses on which the formulae representing the ultimate composition of the proximate elements of the body and of the secretions, are based; and the second includes the additions to animal chemistry made during the period the work was going through the press.

This work, together with Dr Day's reports, will form the groundwork of the present article.

The introduction to, and first chapter of Simon, are devoted to the consideration of preliminary matter relating, for the most part, to the detection of the various substances occurring in the solids and fluids of the animal body. They contain much important information for all who intend to take up animal chemistry practically; but, as we must confine ourselves in this article more to results than to modes of analysis, we must refer those interested in the subject to the work itself, and proceed without further comment to the consideration of

The Blood.—The average specific gravity of human blood has been fixed at 1055 according to Nasse, and at 1056 according to NEW SERIES.—NO. VIII. FEB. 1847.
Zimmermann. The blood of man is always thicker, and at least, a thousandth heavier than that of woman; in a state of health it is always above 1053 in man, while in woman it is frequently not above 1050. Robust men will not unfrequently yield blood of specific gravity 1058 or even 1059, while in pregnant women the specific gravity is sometimes as low as 1045. In very young infants the blood is thin and of low specific gravity.

The temperature of the blood, as it issues from the aorta, has been observed by Simon in the ox and pig. In the former it was 103° F., and in the latter 99°. 5 F.

Passing over the microscopical and general chemical relations of the blood, as subjects with which most of our readers must be tolerably familiar, we arrive at the section "on the chemical physiology of the blood." This section includes the consideration of "the formation of the blood," "the process of respiration," "animal heat," and "the metamorphosis of the blood." The last subject is considered under two heads, namely—the metamorphosis of the blood in the nutrition of the organism, and the active metamorphosis of the blood. In relation to these metamorphoses we meet with the following observations:

"Regarding the blood physically, as composed of corpuscles and plasma, it is only from the latter that the organs can directly obtain nourishment. The plasma is, however, a very complicated fluid; its principal constituents are albumen, fibrin, fatty compounds, salts, extractive matters, and a peculiar colouring matter, hæmaphæin. The question now arises, Are all these constituents, or only some of them, employed in nutrition? Our analyses of urine, sweat, and mucus, show that these secretions and excretions carry off, in addition to certain peculiar matters, the same pigment, the same salts, and the same (or similar) extractive matters, as are contained in the plasma; hence we may infer that those substances which are removed from the body are effete products of the metamorphosis, and that they are not suited for nutriment, at any rate in the form in which they occur. Neither albumen, fibrin, nor fat is found in urine, sweat, or mucus, and the presence of either albumen or fat is always regarded as a symptom of a morbid state. This fact tends to support the opinion, that albumen, fibrin, and fat are the substances which are employed in the nutrition of the peripheral system.

"The blood, in its passage through the capillary network, permeates all organs and tissues; and their cells take up from the plasma those substances which they require for nutrition, and restore to it those which have become effete, and are no longer adapted for the process of nutrition. We may conclude that the act of nutrition is effected by the sole influence of a power inherent in the cells, and that the plasma is entirely passive. If the different tissues of the animal body, different as they are in their chemical composition, obtain their nourishment from the protein, and fat-compounds of the plasma (which contains the elements of the cells, but not the different cellular substances themselves), it is clear that the cells and tissues must produce a metamorphic effect on that portion of the nutriment which is homologous with themselves. Their catalytic, or, as Schwann in his Theory of Cells terms it, their metabolic power, evolves from the plasma the materials that serve for the nutrition of the cells. * * * But although the plasma acts only passively in this nutritive process, we cannot deny it a peculiar vital power. This is first manifested in the formation of the cyto-blastema, for the force that creates these forms cannot be regarded as independent of the plasma. If the nucleus
is formed by the solidification of fibrin in the plasma, which, from the similarity of their constitution, is probable, its formation must be regarded as the result of a purely plastic force in the liquor sanguinis."—Vol. i. pp. 147-8.

The most important constituents of the secretions and excretions separated from the blood are urea, uric acid, bilin, hæmaphæin, biliphaein, extractive matters, lactic acid, and salts. The three first, according to Simon, are not formed during the metamorphosis of the plasma in connexion with the process of nutrition, but are products of the active metamorphosis of the blood-corpuscles.

"It is but reasonable," he observes, "to infer, that such substances as urea, uric acid, and bilin, which are separated in large quantities by the kidneys and liver from the blood, should be products of the metamorphosis of a substance of an invariably uniform composition. In every class of animals, in the most varied forms of existence, under the most opposite kinds of food, we find that the bile is a secretion of the liver; whilst amongst all the higher classes of animals, and many of the lower, urea and uric acid, or one of the two, occur as a constant secretion of the kidney. It seems opposed to all reason to imagine, that in animals as different in structure as they are opposite in their habits of life, and under every possible variation of circumstances, these fixed and definite compounds should be products of the metamorphosis of the plasma during the nutrition of every form of tissue. It is, however, easy to conceive that the corpuscles, which, although different in their form, are similar, if not identical, in their chemical constitution, in the blood of all these animals, should, under similar conditions, yield similar products as the result of their metamorphosis, and that these products should take the form of urea, uric acid, and bilin.

* * * If the urea, uric acid, and bilin were formed in accordance with the other hypothesis, their production would be increased, diminished, or stopped, according as nutrition was proceeding favourably, was deficient, or was entirely checked, as happens in certain disorders. But it is well known that the production of these substances is by no means dependent on such circumstances. The secretion of urea, uric acid, and bilin proceeds, both in man and animals, when the tissues are gradually wasting from disease, and when their nutrition is utterly suspended; they are separated long after the body has ceased to take any food whatever; in fact, as long respiration, and even life itself remains,—the only necessary condition being the healthy state of the secreting organs."—Vol. i. pp. 160, 161.

There still remain for our consideration the extractive matters, the lactic acid of the urine, and the salts. All these substances occur in no inconsiderable quantity in the blood, and their formation during the act of nutrition of the various tissues, is consequently very probable. With regard to the last—the salts—Simon observes that some are peculiar to the plasma of the blood, "and are transmitted from thence into the secretions and excretions, while others (especially the phosphates of lime and magnesia, fluoride of calcium, together with small quantities of the sulphates and carbonates of soda and lime) occur in the bones as actual constituents of the body. The latter are conveyed into the body with the food, partly in the state of phosphates, &c., while their formation is also in part due to the production of phosphoric and sulphuric acids, by oxidation of the phosphorus and sulphur which occur in the proteine-compounds, and the subsequent combination of those acids with bases. These salts are again found in the urine, for they are
removed by the blood during the metamorphosis of the bones, and are excreted by the kidneys."—Vol. i. p. 151.

The chemistry of healthy blood is still in a very unsatisfactory condition. The following experiments of Enderlin seem to disprove the existence of the lactate, oleate, margarate, and albuminate of soda, and of the carbonates of lime, magnesia, and soda, in the blood;—all of which are given by Simon in his list of the constituents of that fluid. His experiments were instituted on the recently incinerated blood. He sums up in the following terms:

1. The ash does not effervesce on the addition of an acid.
2. Hot water poured on the ash becomes alkaline: it holds in solution alkaline phosphates and sulphates, chloride of sodium, and sometimes chloride of potassium, but no other salts.

a. On the addition of a neutral solution of nitrate of silver to this fluid, there is a yellow precipitate which is partly soluble in nitric acid; a portion, however, consisting of chloride of silver, remaining undissolved. The addition of nitric acid causes no effervescence. On neutralising the acid filtrate with ammonia, a yellow precipitate of tribasic phosphate of silver (3 Ag O, P O₅) is thrown down.

b. On treating the aqueous solution of the ash with a solution of chloride of calcium, there is a copious gelatinous precipitate of phosphate of lime (3 Ca O, P O₅) which dissolves in nitric acid without effervescence. On treating this acid solution with nitrate of silver, and neutralising with ammonia, the tribasic phosphate is precipitated as before. The addition of the chloride of calcium neutralises the previously alkaline fluid.

From (1) we see that the alkaline reaction is not due to the presence of alkaline carbonates; and (2) shows it is not dependent on the presence of free potash or soda, for otherwise the fluid would not be neutralized by the chloride of calcium. Hence the albumen of the blood cannot exist as a soda-compound (albuminate of soda); neither can there be alkaline lactates, acetates, nor fatty-acid salts in that fluid; and, on the above grounds, Enderlin conceives that we are justified in assuming that the alkaline reaction of the ash is dependent on the presence of tribasic phosphate of soda (3 Na O, P O₅), and as this is the only salt that remains tribasic at a red heat, he concludes that the alkalinity of the blood, as well as of the ash, is dependent on it.

The question regarding the actual salts occurring in the blood, and in its ash, must, however, be still regarded as an open one.

There are certain substances occurring only in very minute quantities, or in certain diseased states; the most important of these are urea, sugar, and certain constituents of the bile, namely, choleate of soda, and biliphæin.

Marchand got only slight microscopic indications of urea from twenty pounds of the serum of the blood of a healthy cow, and as the urine of that animal contains a larger proportion of urea than that of man, the blood must also contain a larger amount of that ingre-
dient. He calculates (assuming that there are twenty pounds of blood in a man's body, and that one ounce and a half of urea is eliminated in twenty-four hours), that the blood contains only the 15,360th part of its weight of urea, a quantity that could hardly be determined analytically if it were increased thirtyfold.

There are, however, diseased conditions in which it occurs in so large a proportion that its detection is accomplished with comparative ease. The following is Simon's method in looking for urea—

"I treat a certain quantity of the blood with alcohol, for the purpose of throwing down the protein-compounds; then filter; and subsequently wash the residue upon the filter with the alcohol. The alcoholic solution (including the washings of the filter) must be evaporated to a small residue, and treated with anhydrous alcohol. The process must, if necessary, be repeated until the residue is freely soluble in this menstruum. The alcohol must then be evaporated, and the residue dissolved in water, which usually becomes slightly turbid in consequence of the separation of traces of fat. This fat is not easily separated by filtration; if, however, this process is determined upon, a considerable quantity of water is added; it is heated, and allowed to stand for some time. The watery solution will then pass through the filter tolerably clear, but slowly. It must be evaporated to a small residue, thoroughly cooled, and nitric acid then added. If the quantity of urea is not too minute, there are formed almost instantaneously an immense number of glittering crystalline scales. If the quantity of urea is very minute, the crystallized nitrate of urea may not be perceptible for several hours, and even then probably not without the aid of the microscope."—Vol. i. pp. 183, 184.

On treating the extractive matter of blood containing no urea with nitric acid, we may be deceived by the appearances presented by nitrate of soda. The crystals of this salt present a remarkable degree of thickness, and may be distinguished from the nearly similar form of nitrate of urea, by the circumstance that the former are not at all soluble in anhydrous alcohol, while the latter are readily dissolved in it.

Simon once detected sugar in the blood of a calf; it is, however, very seldom to be found in healthy blood, although in certain pathological conditions, especially in diabetes mellitus it may be often discovered without any great difficulty. The best test for its detection is that of Trommer. "The proteine-compounds are first precipitated with anhydrous alcohol, and dry carbonate of potash is then added to the filtered spirituous solution, which must be well shaken. On the addition of a little solution of sulphate of copper, and the application of heat, we observe, if sugar be present, a yellow or yellowish brown tint developed, produced by the reduction of the copper to a state of sub-oxide."—Vol. i. p. 187.

Simon never succeeded in detecting bilin in the blood, nor was Lehmann more successful. Dr Day mentions, in a note to page 188, that it has been detected by Enderlin on three occasions in the blood of calves and oxen; these are, as far as we are aware, the only cases on record.

Biliphaein, the colouring matter of bile, may be observed in the serum in most cases of jaundice. The addition of nitric acid gives
rise to the development of a green tint, which frequently passes in
the course of some hours into a blue or yellow colour.

The healthy Blood in relation to Physiology.—From four analyses of
the blood of horses, Simon concludes that "arterial blood contains less
solid residue generally than venous blood; it contains less fat, less al-
bumen, less hæmatin, and less extractive matter and salts, than venous
blood. The blood-corpuscles of arterial blood contain less colouring
matter than those of venous blood." Four analyses are, however, not
by any means sufficient to determine so important a point; and, in
fact, a few pages further on, after noticing the results obtained by other
chemists, he observes, that "we are led to the conclusion, that there
are certain differences in the composition of arterial and venous blood
which, however, are not constant, but vary, according to circum-
stances." When all the functions of the organism are properly dis-
charged, and when the nutrition exactly corresponds with our actual
wants, we may conclude, à priori, that "the final result of the
changes in the blood during the act of circulation must necessarily
be this—there must be a substitution of fresh and proper nutri-
ment, to supply the place of those constituents of the blood, which
are being perpetually consumed; for it is obvious that if, in each cir-
culation, the consumption of albumen or hæmatoglobulin exceeded
the supply by the merest trace, after a certain period the blood
would acquire an abnormal constitution. We know that albumen,
fibrine, and salts, are consumed in the nutrition of the peripheral
system; if, therefore, the blood receives no fresh supply of these
substances, before it arrives in the larger venous trunks, it is clear
that the venous blood must be poorer in these substances than the
arterial."

The blood also conveys away from the peripheral system various
products formed by the consumption of the tissues; for instance,
certain salts, extractive matters, &c., some of which are eliminated
by the kidneys, in a state of great dilution, while others are removed
by the skin. If the quantity removed exceed the supply, the
venous blood will be poorer in extractive matters and salts than the
arterial; it will be richer in these substances if the reverse be the
case.

"The venous blood will contain more or less water than the arterial, accord-
ing as the elimination of water by the kidneys, liver, skin, and lungs exceeds,
or is less than the quantity supplied by the fluid of nutrition.

"The plasma receives a supply of fibrin from the solution of the blood cor-
puscles; if the supply exceeds the consumption of this constituent in the peri-
pheral system, the venous blood may become richer in fibrin than the arterial.

"From these observations, we are led to conclude, that there is no necessary
variation in the composition of venous and arterial blood."—Vol. i. p. 199.

From comparative analyses of the blood of the portal and hepatic
veins, it appears that the blood-corpuscles are actively engaged in
the secretion of the bile, a view which corresponds with, and tends
to explain other phenomena connected with this secretion. More-
ever, the small amount of colouring matter in the blood of the
hepatic vein leads us to infer, that some of it has been consumed in the formation of the bile,—a view which accounts, with more probability, for the origin of its colour, than the supposition that it is produced from a portion of the plasma. Dr Day confirms Simon's opinion by a quotation from Mulder's "Versuch einer Algemeinen Physiologischen Chemie," in which it is stated, that if the blood-corpuscles undergo a metamorphosis prior to their development into living tissue, the products of the decomposition of the haematin may probably be traced in the bilipherin of the bile.

Passing over, from want of space, the comparison of the blood of the renal veins with that of the aorta, and the comparison of venous blood with the blood of the capillaries, we proceed to the consideration of the absolute composition of healthy venous blood. Simon speaks feelingly on the difficulties he encountered in his investigations on this subject.

"It is not an easy matter to select individuals, from whose state of health we can infer that the composition of the blood closely approximates to the normal standard, and after the selection is made, it is still harder to convince them of the advantage or necessity of venesection in their own cases."—Vol. i. p. 228.

He secured two suitable cases,—N., a youth, aged 17 years, of sanguineous temperament, nearly full grown, and properly developed; and S., a servant girl, aged 28 years, tall, strong, and vigorous, and of a somewhat phlegmatic temperament. The following are the results of his analyses:

|                | N. (Male) | S. (Female) |
|----------------|-----------|-------------|
| Water          | 791.900   | 798.656     |
| Solid constituents | 208.100   | 201.344     |
| Fibrine         | 2.011     | 2.208       |
| Fat             | 1.978     | 2.713       |
| Albumen         | 75.590    | 77.610      |
| Globulin        | 105.165   | 100.890     |
| Haematin        | 7.181     | 5.237       |
| Extractive matters and salts | 14.174 | 9.950 |

100 parts of blood-corpuscles contained, in the former case 6·3, and in the latter, 5·2 of haematin and haemaphelin.

Taking these as descriptive of the composition of normal venous blood, we may give its leading features in the following terms:

"It contains about 20½ of solid constituents; not much more than 0·2½ of fibrine, and about an equal quantity of fat; the blood-corpuscles considerably exceed the albumen in quantity, and contain about 5 or 6½ of colouring matter."

—Vol. i. p. 229.

Simon quotes the analyses of Lecanu and Denis; and to these Dr Day has added those of Nasse, and Becquerel and Rodier; and in his Report on Chemistry, in the third volume of Ranking's Half Yearly Abstract, two analyses by Elsner.

The differences in the blood dependent on sex, constitution, temperament, and age, are then discussed.

From the analyses of Becquerel and Rodier, it appears that the

1 The formula § indicates per centage.
influence of sex is so great, that in order to arrive at any correct conclusions respecting the deviation of morbid blood from the healthy standard, diseased male and female blood must be always contrasted with the respective male and female blood in a state of health. From the mean of the analyses of the blood of eleven men and eight women, it appears that the blood-corpuscles of the former are to those of the latter (in 1000 parts) in the ratio of 141:127, while the water in the two cases stands in the ratio of 779:791.

These differences are much more marked than those in the analyses of Simon or Elsner.

In the observations on the differences depending on age, we may remark that Becquerel and Rodier found, that after the age of 40 or 50 there is a decided and progressive increase of cholesterin in the blood. This is an important fact in a pathological point of view, in relation to atheroma and certain other morbid products.

Diseased Blood.—Simon gives the following table of the maxima and minima of the different constituents of specimens of morbid blood, analysed by himself:

| Constituent                  | Maxima     | Minima     |
|------------------------------|------------|------------|
| Water                        | from 880 to 750 | 750 to 880 |
| Solid residue                | 250 to 112 | 112 to 250 |
| Fibrine                      | 9.1 to 1   | 1 to 9.1   |
| Fat                          | 4.3 to 0.7 | 0.7 to 4.3 |
| Albumen                      | 181 to 55  | 55 to 181  |
| Globulin                     | 106.6 to 30.8 | 30.8 to 106.6 |
| Hæmatin                      | 8.7 to 1.4  | 1.4 to 8.7  |
| Hæmatoglobulin               | 115.4 to 31.2 | 31.2 to 115.4 |
| Extractive matters and salt  | 16.5 to 7.6 | 7.6 to 16.5 |

The deviations from the normal standard observed by Andral and Gavarret are even more striking. They are as follows:

| Constituent                  | Maxima     | Minima     |
|------------------------------|------------|------------|
| Water                        | 915 to 725 | 725 to 915 |
| Solid residue                | 275 to 65  | 65 to 275  |
| Fibrine                      | 10.5 to 0.9 | 0.9 to 10.5 |
| Solid residue of serum       | 114 to 57  | 57 to 114  |
| Blood-corpuscles             | 185 to 21  | 21 to 185  |

From these data it is apparent, that although the proportions of all the constituents are subject in disease, to a certain amount of change, the variations in the amount of the fibrine and globulin are the most striking.

Effects of Venesection on the Blood.—Becquerel and Rodier have laid it down as a general law, that bleeding exerts a remarkable influence on the composition of the blood, the greater, the oftener the bleeding is repeated. They examined the blood of 10 patients who were bled twice, and 10 thrice; so that, for the purpose of comparison, they had 20 first, 20 second, and 10 third bleedings. The most obvious effects of venesection are the increase of the water and the diminution of the blood-corpuscles. The albumen and fibrine appear to be unaffected. We extract the following
numbers from their table of the mean composition of the blood of ten persons bled three times.

| Component       | 1st Analysis | 2nd Analysis | 3rd Analysis |
|-----------------|--------------|--------------|--------------|
| Water           | 793.0        | 807.7        | 833.1        |
| Fibrine         | 3.5          | 3.8          | 3.4          |
| Albumen         | 65.0         | 63.7         | 64.6         |
| Blood-corpuscles| 129.2        | 116.3        | 99.2         |

Classification of Diseased Blood.—Simon arranges diseased blood under four forms:—

1. Hyperinosis—in which the blood contains more fibrine and fat than in the normal state, and the corpuscles decrease in proportion to the excess of fibrine.

This form is met with in inflammatory affections generally, and is perhaps best marked in pneumonia and acute rheumatism. We extract Simon’s observations on the blood in the former of these diseases:—

“The blood usually exhibits the characters of hyperinosis more decidedly in pneumonia than in most other inflammatory diseases; it also retains its heat for a longer period. The clot is rather below the ordinary size, very consistent, and does not break down for a considerable time. It admits of being sliced, and the sections retain their consistency for some time. Its surface is covered with the buffy coat and is more or less cupped. The serum is of a pure yellow colour. The quantity of solid constituents is usually less than in healthy blood.

“The maximum of fibrin in my analyses was 9.15, which is the largest quantity that I have ever discovered in inflamed blood. The minimum was 3.4, and the mean of four analyses was 6.0. Andral and Gavarett found the maximum of fibrin to be 10.5; the minimum 4; and the mean to fluctuate between 7 and 8. They never met with more than 10.5 of fibrin in the whole course of their analyses. The maximum of haematoglobulin occurring in my researches was 78, and the minimum 36, which is very far below the amount in healthy blood. Andral and Gavarett differ from me considerably on this point. They make the maximum of the blood corpuscles 137, and the minimum 83.7. We find, however, in the course of 58 analyses made by them, on the blood of 21 persons labouring under pneumonia, that the amount of corpuscles just reached the normal proportion in 5 cases, in 6 cases exceeded it, and in the 47 remaining cases, fell below it. The average of these cases was 113, which is 14 below the normal quantity in healthy blood, according to Lecanu’s analysis. The maximum of fat in my analyses was 4.3, and the minimum (in a man aged 60 years) was 0.7. The maximum of solid residue was 202; the minimum was 160. In 51 out of the 58 analyses made by Andral and Gavarett, the solid constituents exceeded the ordinary normal proportions.

“In all these cases the quantity of the blood corpuscles was very high: the fibrin, in two cases, reached 9.1, and in one case, 9.0: in the others it was low, or amounted to only the mean in the fibrin in pneumonia.

“The two highest amounts of solid residue, found by Andral and Gavarett, were 230, and 227; in these cases the maxima of corpuscles also occurred. The smallest amount of solid residue was 166, which corresponded with the minimum of blood corpuscles. The mean quantity of solid residue, as deduced from these 58 analyses, was 201, or 9 less than Lecanu’s average for healthy blood.”—Vol. i. pp. 258-60.

Trusting that the above quotation will afford our readers a clear idea of the grand character of hyperinosis, we proceed to the consideration of the second form.
2. Hypinosis, of which the following are the chemical characters:

"The quantity of fibrin is frequently less than in healthy blood, or if it amounts to the normal quantity, its proportion to the blood corpuscles is less than is found in a state of health, (2:1 : 110, Simon, or 3 : 110 Leesay); the quantity of corpuscles is either absolutely increased, or their proportion to the fibrin is larger than in healthy blood: the quantity of solid constituents is also frequently larger than in the normal fluid."

In cases of hypinosis the clot is soft and diffusent, and occasionally no clot is formed. The buffy coat is seldom seen, and when it does occur, it is thin and soft, or forms a gelatinous particoloured deposit on the clot. The serum is sometimes of a deep yellow tinge, from the colouring matter of the bile, or red from blood corpuscles in suspension.

We know less of this than of the former species of blood, because venesection is seldom or ever prescribed in the cases in which it occurs, unless an inflammatory affection be also present.

It exists in cases of abdominal typhus, ordinary continued and intermittent fever, the exanthemata, and cerebral hemorrhage.

3. Spanaemia is Simon's third form of diseased blood. The following are its chemical characters: "The amount of fibrin and of corpuscles is diminished: the amount of residue of serum is either normal, or diminished: the proportion of water is higher than in healthy blood: the amount of salts in the serum is sometimes normal, sometimes diminished."

It occurs in anæmia, cancer of the chylopoietic viscera, scrofula, chlorosis, scurvy, purpura, and putrid fevers. Simon gives an analysis of the blood in chlorosis, and appends a second analysis, after the patient had taken chalybeates for seven weeks. The girl was 19 years of age, and exhibited all the symptoms of unmixed, long-standing chlorosis.

|          | 1         | 2         |
|----------|-----------|-----------|
| Water,   | 671.500   | 806.500   |
| Solid Constituents, | 128.500 | 193.500   |
| Fibrin,  | 2.090     | 1.200     |
| Fat,     | 2.530     | 2.299     |
| Albumen, | 79.820    | 81.230    |
| Globulin,| 30.860    | 90.810    |
| Hematin, | 1.431     | 4.598     |
| Extractive Matters & Salts, | 11.000 | 9.580     |

This change in the composition of the blood affords an excellent illustration of the good effects of ferruginous medicines in these cases. The amount of solid constituents is increased by nearly one-half, while the hematogobulin is actually trebled. Simon observes, that the changes in the condition of the patient kept pace with those of the blood. Before, she was pale, and her lips colourless; now, she presented a really blooming appearance.

We suspect that these are the analyses incorrectly assigned by Dr G. O. Rees to Dr Vetter (On the Analysis of the Blood and Urine, p. 199.)

4. Heterochymeusis, Simon's fourth form, is altogether an artifi-
s. It includes those states of the blood, in which a substance is present that does not exist in the normal fluid: when, for instance, the blood contains urea (in appreciable quantity), sugar, colouring matter of the bile, pus, &c. We doubt the propriety of retaining this class, seeing that all the diseases it embraces might very well be arranged under one or other of the preceding forms.

Under this head, Simon places:

1. Blood containing urea: uraemia, occurring in Bright's disease and in cholera.
2. Blood containing sugar: melitcemia, occurring in diabetes.
3. Blood containing bile-pigment: cholæmia, occurring in icterus.
4. Blood containing free fat: piarhcemia, occasionally noticed in diabetes, hepatitis, dropsy, &c.
5. Blood containing pus: pyohaemia, occurring, according to Gulliver, in all diseases in which there is suppuration, or even inflammatory swelling accompanied with hectic fever.
6. Blood containing animalcules.

With respect to uraemia, we may observe that L'Heretier once discovered a considerable amount of urea in the blood, in a case of gout. (Traité de Chimie Patholog., p. 266.)

Piarhæmia, we are inclined to suspect, depends in a great measure on the nature of the food and the space that has elapsed between meal-time and the performance of venesection. In Dr Day's report, in the 2d volume of Ranking's Half-yearly Abstract, the reader will find an account of Dr Buchanan's experiments on the effect of food on the blood, which throw considerable light on the subject.

In relation to pyohæmia, we may also mention that the best method of detecting pus in the blood is given in Dr Day's third report.

The blood during pregnancy, menstrual blood, the lochial discharge, and the blood of the lower animals, are next discussed. These subjects extend over about fifteen pages, and are almost entirely contributed by the editor. The volume terminates with the consideration of the lymph and chyle.

The third chapter—the first of the second volume—treats of "the secretions of the chylopoietic viscera, and the theory of digestion." It embraces the consideration of the saliva, pancreatic fluid, bile, and gastric juice.

(To be continued.)

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Practical Observations and Suggestions in Medicine, Second Series. By Marshall Hall, M.D., F.R.S. and E., &c. 12mo, pp. 360. London, 1846.

Dr Marshall Hall, all the medical world knows, is a man of genius, and it is now almost as well known that he has no small
his eccentricities and defiance of established time he has done share of the common waywardness of genius. To medicine in his time he has done good service. In his earlier days he distinguished himself by a pains-taking industry, devoted to the improvement of the portraiture of diseases—and it is not impossible, that even the eccentricities and defiance of established forms, so conspicuous in his more recent works, may have been of themselves influential in awakening all ranks of the profession, to the great and real importance of those views of nervous acts in health and disease, which he claims as his own, and which he so perseveringly inculcates. Hall's views of reflex action in the nervous system, have their rudimentary form in the opinions maintained in the last century by Whytt and Prochaska, yet what influence had these, twenty-five years ago, with the bulk of the profession over their notions of the phenomena of health and disease? The opinions of these two distinguished physiologists were not unknown—they were taught by a few, and sometimes obtained the commendations of the periodical press as ingenious, and applicable to the more intelligible explanation of many acts of the living body. But as regarded the prevailing opinions of the day, they were almost a dead letter. If they were making any progress at all, it was slow and imperceptible. Suddenly Dr Hall perceives the subject in a new light, lays down a law of nervous action, and devises a nomenclature to express the phenomena which fall under it—with the enthusiasm which belongs to genius, he pours fact upon fact on the awakened ears of the medical world, extorting their assent as much by his importunity as by his proofs—book after book he sends forth, the nucleus of each being the reflex action of the nervous system; his new discovery he hangs on every part of medicine, careless of repeating himself in these successive works, provided he find another channel by which to attract fresh auditors. And thus, as we feel inclined to believe, he has succeeded in what he otherwise might have failed, namely, in fixing universal attention on a mode of investigating the laws of nervous action to which for more than sixty years Prochaska, Whytt, and their few followers, had been striving to attract assent in vain. Thus, Hall's penetration and enthusiasm have quickened the slow progress, to which this part of practical physiology would otherwise most probably have been condemned, and thrown us forward to a point which, but for him, might not have been attained for many years. What though his method of prosecuting and propagating his discovery be not conducive to the perfect exactness which physiological and pathological inquiries demand, he has stirred the curiosity of the medical public on this subject, and aroused a spirit of inquiry among men accustomed to the sober examination of such questions—of whom there is no want in this age—so that in no long time the science of medicine must give to him the credit of originating a large additional amount of knowledge on the laws which regulate the acts of the nervous system. To the writings of such a man we feel disinclined to apply the common standards of criti-
OBservations and Suggestions in Medicine. 605
cism. The medical press, forgetting his peculiar character and merits, has too often treated his deviations from ordinary rules very much like those of a common offender. We could easily tolerate the vagaries of a new Marshall Hall, who should lay open to us such another field of investigation in the economy of the living body—we wish we saw a coming host of them. The good they would do would live after them, and their errors would lie altogether on the surface, to be seen at the first glance. They would form a class of writers apart, whom critics would be compelled to respect. Their writings, like those of our author, would be a kind of autobiography of their minds, and would furnish a new chapter in psychology.

The work before us, like all our author’s recent works, abounds in illustrations of reflex action, and may be regarded as, in the main, a new commentary on that subject. The titles of the chapters will show our readers how miscellaneous are its contents. These are, “Introductory Observations;” “Instances of the Relation of Physiology to Practice;” “Extract from a Lecture on the Nervous System, delivered at St Thomas’s Hospital;” “A succinct View of the Nervous System;” “On the Influence of Emotion;” “On the Influence of Sleep;” “On the Influence of the Mind on the Body;” “Galvanism as a Test of the Irritability of the Muscular Fibre;” “On a certain Form of Paralysis in Children;” “Idea of Physiology; Mind, Nerve, Blood, Muscle;” “The Dura Mater excit.or; Diagnosis of Diseases of the Brain;” “The complex Nature of an Act of Volition;” “The Condition of the Hemiplegic Hand;” “On the Nature of Inflammation;” “On the Spring Bed;” “The Mosquito-net,” &c.

In our quotations from this volume we propose to confine ourselves to some of the practical or alleged practical observations contained in it, though these are fewer than its title would lead us to expect. The first we meet with is on the spring-bed, which he strongly recommends to the profession, as in common use on the Continent, and preferable to the water-bed.

Our author next extols the mosquito-net, employed in warm climates, as a most effective defence from the night cold of this climate.

Speaking of the treatment of affections of the head in the puerperal state, he says—

“But I would particularly observe, that a state of exhaustion, from loss of blood generally from the system, does not protect the brain from a state of vascular fulness. This I consider to be abundantly proved in the excellent paper of Dr Kellie, in the Medico-Chirurgical Transactions of Edinburgh, and by the fact of the occurrence of convulsions, and even of apoplexy, in this state of exhaustion. It is in this very case that cupping of the occiput and nucha is so strongly to be recommended. The brain, in some cases of exhaustion, is relieved by the topical abstraction of a very small quantity of blood; and this relief is not only obtained by a less expenditure of blood, but is more permanent than similar relief effected by general blood-letting.”—P. 116.
Again, under the subject of inflammations following parturition, he says—

"The effects of intestinal irritation, and of loss of blood, are indeed, as I shall proceed to show, apt to produce symptoms of increased action resembling those of inflammatory disease, and prompting the use of evacuant remedies. This proceeding is attended by two sources of error: in the first place, the symptoms are frequently relieved in the first instance—a state of faintishness taking place of that of reaction, and the physician is apt to judge that the remedy had relieved, but was used in too mild a degree to subdue the disease, and is therefore led to a repetition of the measure; in the second place, after the first and second moderate use of the lancet, for instance, the reaction returns in a still more violent degree than before, and it is then imagined that the disease, though relieved, was not only not subdued, but had been suffered to make fearful progress; the lancet is therefore again used, until it may be that the powers of the system yield, and sinking takes place of reaction, or, if the last blood-letting be considerable, the scene may be closed by a sudden and unexpected dissolution. I published several sad instances of this kind in a former little work upon this subject."—Pp. 118, 119.

Our author enters at some length on the treatment of puerperal peritonitis, but for his observations on this subject we must refer to the work itself. We must also pass by his chapter on puerperal stomachal and intestinal irritation, which does not admit of being condensed.

Speaking of the principles of treatment in cases of the effects of the loss of blood in the puerperal state, he remarks that this state of exhaustion, either with or without reaction, does not preclude the possibility of congestion within the head, and for the purpose of subduing it, he recommends the abstraction of a small quantity of blood from the nape of the neck, by cupping, or from the temporal artery, unless in the most extreme cases, in which the loss of even a very small quantity of blood might exhaust the remaining strength of the patient. On this point we would suggest, as a caution, that some of the symptoms of enfeebled circulation within the head are not unlike those of congestion. In the state of exhaustion under consideration, he particularly insists on attention to the state of the bowels, remarking, that if the bowels were free from disorder before the occurrence of loss of blood, this state never fails to induce derangement. His treatment is the daily evacuation of the bowels, by means of a very copious warm water injection, with or without the aid of a draught, containing an ounce of the infusion of senna, and two or three drachms of the compound tincture of rhubarb and of manna. Against the irritability of the system, so apt to occur in exhaustion from loss of blood, he insists on an efficient anodyne, as the tincture of opium, the tincture of hyocyamus, with the spiritus ammonis aromaticus, or what he says is preferable, Battley's solution, or the extract of poppy. To this treatment are to be added nourishment, fresh air, quiet, soothing, sleep.

The chapter on the diagnosis of puerperal diseases, contains some interesting observations. One difficulty he dwells upon, namely, the frequent combination of inflammation with intestinal
irritation, or of either or of both with the effects of the loss of blood. In his opinion, authors on the subject of puerperal diseases, have often combined into one description all the several separate cases just referred to. We quote the observation with which the chapter opens:

"Our systems of nosology have, I am persuaded, greatly erred, in attempting to separate diseases from each other, and describe them as distinct, when they far more frequently occur in conjunction; so that the mind of the medical student is not at all prepared for the cases which most frequently occur to him when he first enters upon practice. A little experience teaches him the difficulty, nay, the absurdity, of attempting to give each individual case a name, or to put it down in a list of diseases. Each patient, on the contrary, presents to him a new congeries of symptoms, a new complication of diseases or disorders."—P. 175.

This is a very important observation, very familiar to every man of moderate experience in practice, and yet not always sufficiently attended to in diagnosis. We cannot, however, join Dr Hall in his condemnation of Nosology. For if Nosology give an exact account of affections, which either sometimes occur, or can be easily conceived to occur, uncomplicated, it can be no impediment to our going forward to the knowledge of the complex cases which most usually are seen in practice. On the contrary, the only natural mode of studying complex cases advantageously is, to study, in the first place, the elementary cases out of which they are compounded. Nosology is bad, only when it is behind the actual state of our knowledge of diseases, or when it is studied alone. Its just place in the order of study is, as a preliminary to clinical medicine, the proper business of which is, to initiate the student in the knowledge of diseases as they actually occur in practice.

The chapter on the fatal effects of blood-letting in puerperal affections, being chiefly composed of cases, we cannot condense within our prescribed limits.

The chapter on the general influence of air, exercise, bathing, and clothing, deserves attention. He reprobates, with deserved severity, the too common practice of attempting to harden delicate children by the use of a scanty dress.

The chapter on the plan of observation of diseases of the nervous system is well deserving of attention, but we find it impossible to give a useful condensation of it.

To conclude, there can be no doubt that this work contains a great deal of valuable matter, both immediately available in practice, and also suggestive of improvement, as well in the general science of medicine as in the kind of training by which individuals, each according to the turn of his own mind, must fit themselves for its successful application. It cannot be concealed that it has great faults,—faults, as we have already said, which could not be tolerated except in such a man as Dr Hall. And we must say, woe be to the unhappy wight who, without his already earned reputation, attempts to write books of so rambling a character.