for carrying political events, caricatures of great personages, and other information. Artists in metal, ivory, and wood, jewelers and enamellers, are engaged in this manufacture, and our French neighbors still take the lead in fan manufacture. We must not omit to mention No. 147—a Chinese fan with paper leaf, and with 14 brins composed of ivory pierced and carved, silver filagree and enamel, scarlet ivory, tortoise-shells, white pearl, etc., placed alternately, exhibited by Mr. R. W. Edis, F.S.A.; and especially the fine series of fans of the period of the French Revolution, lent by M. A. de Liesville, of Paris, variously representing the taking of the Bastille, the Fête of the Federation, portraits of Louis XVI. and Lafayette, Robespierre burning Atheism and Fanaticism, and unveiling Truth, and portraits of Le Pelletier and Murat.—*Building News*.

RED BLOOD-CORPUSCLES.

By W. H. HAMMOND.*

In my last paper on the structure of the living blood-corpuscles of a young trout, I pointed out that a nucleus could be plainly seen with a power of a little more than 300 diameters. I have since then extended my observations to the structure of the same corpuscles in the blood of other vertebrates. My first observation was made on a very young duck, and in this bird I was able to see the blood as it flowed in a small vein or capillary just at one part of the web of the foot. I could see plainly with the same power as before that the red blood-corpuscles are circular, with a distinct nucleus, which could be plainly seen both when the corpuscles exposed their broad surfaces, and also when they were sideways. These corpuscles have no cylindrical ring, but are flat from the nucleus to the circumference. My next observations were made on a living minnow and roach; the corpuscles are just like those seen in the young trout with a nucleus, clearly seen with the same power as before. In the living stickleback I noticed that the corpuscles are smaller than those seen in the trout (as is shown in Professor Gulliver's Tables), but of the same shape, and the nucleus is as plainly visible. On another occasion I watched the circulation in some young tadpoles and newts. In the very young tadpole I noticed that the red corpuscles were covered with small round bodies looking like vesicles; the corpuscles were oval when their broad surfaces were exposed, and appeared lanceolate when seen sideways. The corpuscles seemed very elastic, and were easily squeezed out of and resumed their shape when turning a corner. In the small blood vessels in which the corpuscles flowed in single file, I had a good view of the "tailing out" of the corpuscles; but, with the same power as before, I could not make out any

Fig. 1.—Tailing-off of the red corpuscle under a high power.
2.—Tailing-off of the red corpuscle under a lower power.

nucleus, though several times I thought I saw a faint appearance of it. In an older tadpole, which had two legs formed, I noticed that the corpuscles had fewer vesicles on them; in other respects they were the same as in the younger ones. In a frog's foot the corpuscles had no vesicles on them.

I then tried to see the circulation under a high power in the tadpole of the frog, in the newt, and in the frog's foot. I used a $\frac{1}{2}$ objective with B, C, and D eye-pieces, and am happy to say that I was successful. I could with this high power see a nucleus in nearly all the red blood-corpuscles of the tadpole. The corpuscles are oval, and the nucleus is very large. When the corpuscles were sideways, I could plainly see the nucleus projecting on both sides; the nucleus does not project so boldly as in fishes, but is bigger and longer. This accounts for the lanceolate or fusiform appearance when seen under a lower power.

The tailing-off of the red corpuscle is due to the nucleus being displaced to the forward part of the envelope, as shown in the annexed engraving, and this fact is submitted as one of the proofs of the heterogeneity of the living corpuscle; in other words, that it is a compound body, and by no means simple and structureless.

In the young newt I could also plainly see the nucleus in the corpuscles. They are similar to the frog-tadpole's, but larger; the nucleus is very large, and the marginal portion very thin. I have several times seen this portion double back over the nucleus.

After the newt had been under the microscope some time, the circulation stopped in some of the small veins; the corpuscles then looked circular, were not so transparent, and showed no trace of a nucleus. I would ask, may not this have been the appearance which was seen by Professor Savory, and which led him to the conclusion that the red blood-corpuscles have no nucleus?

In the living blood-corpuscles the nucleus has a very different appearance to what it has when seen in the corpuscles after they have been drawn from the body and put on a glass slide.

In conclusion, I think I have now proved the existence of a nucleus in the living red blood-corpuscles of fishes, batrachians, and birds. I have been as careful as possible when making my observations under the high power; I sat a whole day watching the circulation in the tadpole of the frog and newt.

I must add that though the nucleus can be seen in fishes very plainly under a half-inch objective, with ordinary illumination, yet in frogs, newts, and tadpoles, it requires a much higher power, and even then, unless the light is care-

* It would be well if the author of this paper would refer to the splendid researches of Stricker, Schweigger-Seidel, Max Schultze, and Brücke, the last of whom describes the mammalian blood-globule as consisting of two separate parts, the *zona* and *ekoloid*. It may be remarked that Mr. Hammond's researches have this special value, that they are confined to the living corpuscles of pyrenæmatous vertebrates.

fully regulated, the nucleus may be missed. I used a Webster condenser with the iris diaphragm, and found that as much care was required with the illumination as when resolving difficult diatoms.—*Microscopical Journal*.

August 2, 1877.

FREE AMMONIA IN CAST STEEL.

By P. REGNARD.

On breaking several ingots of steel made by "Ponsard's method," a decided odor of ammonia was noticed, accompanied by a slight hissing, the latter being very perceptible when the ear was applied against the ingot. The evolution of gas was clearly shown by wetting the fractured surface with soap and water, frothing resulted, and the volume of gas thus evolved from a single specimen was somewhat greater than one centimeter cube.

The gas was collected from one hundred ingots and analyzed. It burned with a scarcely luminous flame, and detonated strongly when mixed with air. It proved to be nearly pure hydrogen, with perhaps a trace of acetylene. No gas was obtained from the metal when it was re-cast previous to being broken.—*Compt. Rend.*

[The absence both of ammonia and nitrogen from the analyzed gas is so remarkable, that it might almost be supposed that the gas had been collected over water. It is not distinctly stated so in the paper, but it certainly seems to be implied that such was the case.—Abs.]—*Journal Chem. Society*.

PLATINUM ORE FROM THE URAL MOUNTAINS.

By SERGIUS KERN.

The platinum ores of the Nishni-Tanil and Goroblagodatsky districts contain notable quantities of foreign metals of the platinum group, with the exception of ruthenium, which occurs only in traces. The amount of platinum varies from 71.2—89.05 per cent., rhodium from 1.05—4.6, and iron, 3.4—13.4. The ore is not refined in Russia, but is sold at a low price to England and France, whence it returns as crucibles, etc., at a higher price. In Russia, French crucibles are preferred to English, but the author considers the platinum of the English crucible to be of a higher quality and purer, containing copper as traces, and iron to the amount of .002 per cent., whereas the French crucibles contain copper (0.22—0.67 per cent.) and iron (0.3 per cent.).—*Chem. News*.

ACONITIC ACID IN THE JUICE OF THE SUGAR-CANE.

By ARNO BEHR.

In the juice of the sugar-cane the author finds aconitic acid, $C_6H_4O_8$, which, he points out, may correspond, in the sugar-cane, with the citric acid $C_6H_8O_7$, that accompanies sugar $C_6H_{12}O_6$ in beet-root.—*Deut. Chem. Ges. Ber.*

DIFFERENCES OF CHEMICAL STRUCTURE AND OF DIGESTION AMONGST ANIMALS.

By F. HOPPE-SEYLER.

In the glands of the stomach of every warm-blooded animal a ferment is found, named *pepsin*, which when extracted with water containing 0.2 per cent. of hydrochloric acid, gives a solution, capable, at the temperature of the blood, of rapidly dissolving albumen.

A somewhat similar ferment, discovered by Fick and Murisier in the stomachs of frogs, pikes and trout, differs from pepsin by acting most actively at a low temperature, as at 20°, and losing its digestive power at the temperature of the blood. This difference in the action of the two ferments probably resembles that between the diastase of the pancreas and of germinating barley.

In carnivorous plants, the acid reaction of the secretions, and the formation of peptone, coupled with the results of Gorup-Besanez's investigations on *Nepenthes*, suggested that the digestive property of these secretions is due to a ferment similar to pepsin. But experiments made in conjunction with Dr. E. Hertel on *Drosera rotundifolia* have shown that it is neither pepsin, nor identical with the ferment contained in the stomachs of cold-blooded vertebrates.

It would be well to find out whether the so-called "spittle" of *Doleum galea*, which, according to Boedeker and others, contains free sulphuric and hydrochloric acids, also contains a ferment and is used for digestion.

Having sought in vain to find any statements as to the digestive ferments of invertebrates, I examined the river cray-fish.

In the stomach is found a plentiful supply of a yellowish-brown, feebly acid juice, which possesses an energetic fermenting power, and rapidly dissolves fibrin. The addition of a few drops of a 2 per cent. hydrochloric acid solution stops the action, and other experiments show the ferment to be similar to, if not identical with, the albumen-dissolving ferment of the pancreas of vertebrates. The aggregated tubular glands, commonly known as the liver, proved to be the source of this juice. These glands may therefore be looked upon as forming the pancreas.

In the river cray-fish a proper stomachic digestion, such as is peculiar to the vertebrates, is entirely wanting, and consequently they possess enormously large glands having the property of the pancreas.

Comparative anatomists have called these glands liver, without however having enquired whether they performed the function of that organ or not. In vertebrates their function is the formation of bile and glycogen. Though a small quantity of the latter was found, it might easily have resulted from the large amoeboid cells present in the organ. The constituents of bile were, however, not present, and so far as I know, neither biliary coloring matter nor acids have ever been found in any invertebrate. On the other hand, no vertebrate is known which, possessing a liver, does not form bilirubin, biliverdin and biliary acids. Now the biliary coloring matter is due to the decomposition of the coloring matter of the blood; but, with few exceptions, hemoglobin is not found in the invertebrates, and those which do possess it in their blood, lack red corpuscles, the hemoglobin being merely dissolved in the plasma. A liver producing biliary acids and coloring matter may consequently be considered as characteristic of vertebrates, just as well as a closed circulatory system containing blood with red corpuscles.

It is strange that amphioxus should be classed among the vertebrates, simply from the relative position of the spinal chord and digestive cavity to the *chorda dorsalis*, while with the exception of the latter, it possesses nothing in common with the vertebrates. A sound system of classification should

not only consider the morphology, but summarize the entire organization. Considered generally, the cephalopoda stand next to the vertebrata; amphioxus is lower in the scale.

Again, comparing the constituents of tissues of lower organisms with those of higher, one finds the appearance of mucin-forming tissue, soon chondrin-forming, and lastly, in the cephalopoda the appearance of glutin-forming tissue. The same order is found in the successive stages of development of the embryo, and this can scarcely be considered an accidental agreement.

Looking at the question broadly, we find that the chemical composition of the tissues and the chemical functions of the organs present undoubted relations to the stages of development, which show themselves in the zoological system, as well as in the early stages of development of each individual higher organism. These relations deserve further notice and investigation, and are qualified in many respects to prevent and correct errors in the classification of animals.

It is generally supposed that the study of development is a purely morphological science, but it also presents a large field for chemical research.—*Pflüger's Archiv. f. Physiologie*.

FORMATION OF GLYCOGEN IN THE BODIES OF ANIMALS.

By J. FORSTER.

SUGAR was injected into the veins of dogs which had been kept without food for several days, the animals were killed, and the glycogen in the liver was estimated. Comparable experiments, omitting the injection of sugar, were also performed. A notable increase in the amount of glycogen found followed the injection of sugar. The author regarded this increase as a product of the increased decomposition of albuminous bodies in the organism brought about by the sugar. Sugar was detected in considerable quantities in the blood of the animals experimented upon.—*N. Rep. Pharm.*

FORMATION AND SEPARATION OF PEPSIN.

By P. GRÜTZNER.

PEPSIN diminishes during digestion. The author contradicts Schiff's statement that certain substances, dextrin for example, are capable of causing an increase in the quantity of pepsin in the juices of the stomach. Schiff's method of determining pepsin in the stomach is declared to be untrustworthy. The author's researches upon the variations in the amount of pepsin under different physiological conditions, show that the amount of pepsin in the stomach does undergo variation; that the smaller cells of the stomach or pylorus (Hauptzellen) when large and clear, contain much pepsin; when small and turbid, little pepsin. The amount of pepsin increases from the moment that nourishment is administered (to dogs) until the expiration of 9 hours; it then decreases until the expiry of 30 hours, when it again very slowly increases till 40 hours are passed, after which it remains constant.

The administration of common salt causes a larger secretion of pepsin: the salt appears to act by decomposing compounds containing pepsin in the pylorus.—*Chem. Centr.*

THE PANCREATIC JUICE OF HERBIVORA.

By A. HENRY AND P. WALLHEIM.

It appears probable that the pancreatic juice of the rabbit, unlike that of the dog, continues to flow during fasting, though to lesser extent than during digestion. The quantity secreted amounts to from 0.6—0.7 c.c. per hour, and gives, as the mean of 14 experiments, 1.76 per cent. of solid constituents. The pancreatic juice of the sheep contains from 2 to 3.5 per cent. of solid constituents.

Chemically and physically these secretions differ considerably from that of the dog. Unlike the latter, the juice of the rabbit does not solidify on warming, but flocculent masses separate out from it and rise to the surface. Where the secretion shows on boiling but a slight opalescence, it becomes quite cloudy if acidified before boiling; the precipitate, however, re-dissolves in excess of strong acid. The juice dropped into dilute acetic acid, liberates carbonic acid. Nitric acid produces a flocculent precipitate, turning yellow on warming. Alcohol precipitates an albuminate.

The secretion of the sheep acts as above, except that, on dropping it into dilute acetic acid, a precipitate is formed which immediately re-dissolves.

The juices operated upon are believed, and, so far as possible, proved, to be the normal secretions of the organ.—*Pflüger's Archiv. f. Physiologie*.

ON SULPHOCYANATES IN URINE.

By R. GSCHIEDLEN.

THE sulphates and phosphates having been removed from 100 c.c. of urine by baryta-water, the filtrate evaporated to a syrup, extracted with alcohol, and the residue left on evaporating this extract dissolved in water, a solution is obtained which after decolorization with charcoal strikes a deep red color with ferric chloride. This color is due to the presence of a sulphocyanate. The absence of such other substances as could produce it having first been proved, the presence of a sulphocyanate was fully verified.

Experiments were made on the reactions of this substance, and, unless there be another body present, the results which have been obtained show that the various reactions observed by Schönbein, Sertoli, Lobisch and Voit are due to the presence of this sulphocyanate. This statement must be modified if, as sometimes stated, hyposulphurous acid is to be found in urine.

The results of 14 experiments made by means of Oehl's volumetric method gave 0.0225 as the quantity of sulphocyanogen in 1000 parts of urine; this corresponds with 0.0314 of sodium sulphocyanate and 0.0376 of potassic sulphocyanate.

The question now arose whether it was due to the saliva or formed by some special organ. The saliva of a dog having been diverted from the mouth was collected separately, and the urine also collected during six days. The saliva contained sulphocyanates, the urine none. A similar experiment in which the urine was collected for nine days gave a like result.

The total quantity of sulphocyanates in the saliva, as estimated by Oehl, agrees with that found in the urine.

From these investigations it appears that a sulphocyanate is a normal constituent of the healthy urine of mammals.—*Pflüger's Archiv. f. Physiologie*.