Their prognathism is not very marked, and the nasal index is medium, averaging 50.3. They have none of the special characteristics of the Negritos, or, in fact, of any of the woolly-haired races, but enter rather into the type of the lower grades of the inhabitants of Bengal.

From whatever elements the present population of India has been formed, there is now, when the Mongoloid people of the north and east are excluded, a considerable uniformity among them in physical characters, and it is exceedingly difficult to classify them, as the different groups, however they may differ if we take extreme types, blend insensibly into one another. They are separated by language into two great divisions—1. The Aryans; and 2. The Non-Aryans; the majority of whom speak one of the agglutinative tongues collectively called *Dravidian*. The Aryans came into India by the north-west by way of the Punjab about one thousand five hundred years before our era, as is supposed. They now occupy the great alluvial plains of the Indus and Ganges between the Himalayas and the elevated plateau of Central India, and have spread southwards along both coasts as far as Ceylon. The Dravidians, who occupy the greater part of the country southwards from the Nerbudda river, are supposed to be descended mainly from the people who inhabited the country before the Aryan immigration. They are again divided into two groups—*a*. The civilised Dravidians speaking Tamil, Telugu, Canarese, etc., constituting the great mass of the people of the peninsula; and *b*. The wild tribes of the mountainous districts of the interior. By some ethnologists, the latter are considered as belonging to the same race as the former. Others consider that they are remnants of a still earlier (*Predravidian*) population, often spoken of as the "Aborigines", the Dravidians being held to be a Turanian race who invaded India from the north some time before the Aryan invasion. These "Hill Tribes", as they are often called, separated from the majority of the inhabitants of the peninsula by their religion, customs, and social condition are, therefore, of great interest to the ethnologist, representing undoubtedly the oldest stratum of the population. By their languages, they are divided into two groups—1. Those that speak Dravidian: the Gonds, a very numerous race; the Khonds, notorious for their cruel human sacrifices, only lately put an end to through British influence; the Oraons, etc.; 2. The Munda or Kolarian family, composed of numerous tribes called Coles, Hos, Moondahs, Santals, Billahs, etc., who speak languages having neither Dravidian nor Aryan affinities. Although very much information has been collected of late through the labours of General Dalton, Sir George Campbell, and others, relating to the languages and customs of the people, very little is yet known of their physical characters. Descriptions of their external appearances vary very much according to the observer, and no good series of their skeletons or skulls has ever been accurately described. Sir G. Campbell speaks of them as "Negrito in physical type, African rather than Mongolian in features, small, slight, very black; face broad and flat, thick prominent lips, broad nose, scanty beard, hair very abundant and tangled, sometimes curly or even woolly. From the Thibetian or Mongolian people they are *world-wide* asunder." Professor Huxley, struck with their resemblance to the Australians, says: "The proper population of the Dekhan has no analogue in north-eastern or north-western Asia; they are long headed, dark skinned, and dark eyed men, with black wavy hair, devoid of any indication of woolliness; not unfrequently they exhibit prominent brow ridges. Examples of them are to be commonly seen in the coolies who work their way over to this country as Indian men, and anyone who has ever seen an Australian native will be struck with the resemblance between the two." (*Jour. Ethnol. Soc.*, 1868-69, p. 92.)

Dr. John Shortt, of the Madras Medical Service, has lately sent to the Museum a series of twenty skulls belonging to the tribes of Maravars, who inhabit the Madura district in the south of the peninsula. He has also sent a series of equal number to the Museum of the Paris Anthropological Society, which has been described by M. Callmand in a recent number of the *Revue d'Anthropologie*. The resemblances between these two series is very interesting, as it shows that with a tolerably pure race averages of even so small a number as twenty can be depended upon. As regards the capacity, the average, maximum, and minimum in the Paris skulls are respectively 1281, 1535, and 1107 cubic centimetres; in our series 1268, 1530, and 1100. Something may, of course, be due to difference in the method of measurement, Broca's method, used in Paris, always giving a larger result than ours, but the correspondence is very striking. The average length of the Paris series is 174.5, of ours 175.6; but in the former the projection of the glabella is included. The average breadth is 131.0 in both. The latitudinal index is 746 in the one, and 751 in the other series, the difference arising from the same cause. The altitudinal, the nasal, and the orbital indices are respectively 752 and 758, 521 and 510, 839 and 854. These skulls, on the whole, differ totally from those of the Andamanese, especially in the great development of the occipital region. Nor

do they present any striking resemblances either to those of the Australians or to any of the Mongoloid races. Their characters do not differ much from those of the mixed population of Bengal generally, among which a moderate degree of dolichocephaly prevails, the average index being 74 to 75. These Maravars may not belong to the races among which the characters of the original hill-tribes should be looked for, but we have at present very few of the latter at command, and no evidence has yet been found of cranial conformation bearing out the view of the Australian affinities of these people derived from external appearances, though this may arise only from want of material. The presence of a Negrito, *i.e.*, woolly haired and brachycephalic, element in the population of India, is also based at present on very slender evidence.

LÉTH-ALBUMEN.*

By JOHN GREENE, L.R.C.P.Ed., Birmingham.

In a recent work of Dr. Herzen, an Italian physician, is a sentence of which the following is a translation.

"I have not treated at length the renal secretion, because, with respect to it, the most absolute discord reigns; and the diverse and contradictory opinions held concerning it are defended by suppositions more or less probable, but destitute of real proof, and resist any but the most searching criticism."

The most important of these controversies is as to the nature and contents of the so-called extractives; an expression which conveniently cloaks a somewhat obscure corner in the scheme of urinary constituents. Hereupon I desire to bring forward an account of certain experiments, showing the presence in healthy urine of a substance allied to albumen; and though the necessary work to be done on the threshold of such an inquiry has engrossed my attention, I shall yet be able to offer for consideration one or two novel points which appear worthy to be placed before the Branch.

About twenty-five years ago, M. Gigon of Angoulême announced the existence of albumen in healthy urine that could be thrown down by chloroform. He was contradicted by Becquerel and by Aran; and Parkes dismisses the question by the curt remark, "that there is no doubt the latter were right". Dr. George Harley is the only English authority who accepts Gigon's assertion. He even goes as far as a statement of quantity. I have had an interview with Dr. Harley, from which I conclude that this was a conjecture founded upon the apparent results of experiment with absolute alcohol; and, though this method is fallacious, it is remarkable how closely correct is the estimate he gives. Dr. Thudichum states that the albumen of the food leaves the body in the form of urea; but that when albumen is discharged in the urine, it is a sign of severe disease in the blood or kidneys; thus passing over the *primâ facie* probability of the presence in health of a modified form of albumen.

It is clear that there exist a considerable number of varieties or modifications; and it is within the experience of all of us in the course of our investigations to have met with forms exhibiting unusual or eccentric reactions.

According to Watts's *Dictionary of Chemistry*, Frémy and Valencennes have described several peculiar modifications; but they need not be referred to further than to say that there is one which is neither coagulated by heat, nor precipitated by nitric acid. I here recall the fact that this is analogous with the definite or true peptone of the stomach.

Scherer, of world-wide renown, announces the peculiar forms obtained from cases of ovarian dropsy; these he calls *paralbumen* and *metalbumen*, the latter of which was remarkable by not being coagulable by heat, nor precipitable by acetic acid, or hydrochloric acid, or by ferrocyanide of potassium after acidulation; and, further, by being redissoluble in water after precipitation by alcohol. Other forms have also been recorded, including Dr. Bence Jones's "deutoxide of albumen".

To resume: On precipitating urine with a large excess of absolute alcohol, in addition to the albuminoid element so brought down, there is a considerable proportion of the saline constituents. I carefully estimated the amount of salts in a given portion of urine, and again in the filtrate and washings in a similar quantity of the same urine after precipitation by alcohol; there was at once apparent a large loss of phosphates and urates; the urea came out exactly the same, urea being soluble in alcohol. From this analysis, it was clear that the use of absolute alcohol as a reagent to isolate the albuminoid material in urine was futile.

The well known action of the bichloride of mercury then suggested it as an appropriate agent; and it is from the precipitate in urine formed by this salt that I am now able to show about an ounce of an

* Read before the Birmingham and Midland Counties Branch.

albuminous substance preserved in spirit, which I venture to call *lêth-albumen*: first, in view of the fact that it is a constant and universal urinary excretive, nitrogenous, effete material, and so lethal or deadly in contradistinction to that other form of albumen proceeding from the peptones, and contributory to vital existence and physical growth; and, secondly, because the word *lêthatus*, a participle signifying "put to death", seems scientifically consistent with the ultimate analysis of the substance in relation to that of albumen proper, by which it would theoretically appear that albumen by oxidation might be converted in the *lêth-albumen*, and the latter, by still further oxidation, into urea.

Now, the bichloride of mercury will not precipitate urea. This I have proved by adding it to a solution of ordinary commercial urea, and also by quantitatively estimating, both before and after the addition of the mercury-salt, when I found the same quantity to exist. The bichloride will not precipitate phosphates, chlorides, sulphates, or urates; it has no action on mucus-flakes. The so-called *lêth-albumen* comes, then, from the extractives.

The different bodies that have been described under this head are very numerous. Many of these, such as xanthine, hypoxanthine, sarcine, xanthoglobuline, and the like, are, all taken together, very minute in relation to *lêth-albumen*. Of the more important elements, creatine and creatinine, much diversity of opinion exists as to amount. A gentleman named Scottin, quoted by Parkes, desiring to state the great increase in creatinine which he found to obtain in typhoid fever, says that, in this complaint, it sometimes rises as high as from three to five grains, whilst Thudichum places the normal elimination at seven grains. In *lêth-albumen*, we have to account for about forty grains daily average. On looking over the learned work of Dr. Thudichum on *The Pathology of the Urine*, more especially that portion having reference to the substances comprised under the head extractives, I cannot avoid the reflection that some of these substances have the same parentage, the diversity arising from the character of the chemical process employed in extracting them. The bodies *reducine-barium*, and *kryptophanic acid*, the substance I call *lêth-albumen*, and albumen proper, all give precipitates with one or other of the salts of the same heavy metals. Albumen proper, the most stable of the above bodies, varies in its products according to the method or chemical material with which it is treated. For instance, the xanthoproteic acid of Mulder is undoubtedly a creation of the laboratory. How much more likely, then, is this quasi-albumen to be split up by some of Dr. Thudichum's processes—this substance which I know from observation to be of a most unstable character? Again, the three chief albuminoids—albumen, fibrin, and casein—are reciprocally convertible within the body.

To suggest how heavily chemical investigation bears upon the albuminoids, I will mention that, when these are treated with strong oxidising agents, certain volatile products appear, of which thirteen have been identified.

In a similar spirit of scientific evolution, Dr. Thudichum proceeds to describe bodies produced by chemolysis, or chemical cleavage of the urochrome, or yellow colouring matter of the urine; and then the numerous compounds of these with metallic bases, with their chemical formulæ and percentage composition. But nowhere am I able to find that this precipitate with corrosive sublimate has been examined or described. At page 375 of Dr. Thudichum's work, occurs the following remarkable statement: "When sublimate does not produce any precipitate in urine, we may be sure that no albumen is present likely to interfere with the correctness of the urea analysis."

Now, firstly, my experience, at any rate, assures me that it is impossible for any person to produce an urine that will not give a marked precipitate with bichloride of mercury; and, secondly, the body that it does precipitate will interfere with the correctness of the urea-analysis. Of the substances that it is possible to conceive might be brought down by corrosive sublimate, Dr. Thudichum describes *kryptophanic acid*, of which, in twenty-four hours, there are ten grains; creatine and creatinine, at the highest estimate, eleven grains; *reducine-barium*, undetermined; urochrome, undetermined.

Of these five named substances, *kryptophanic acid* is stated to give no precipitate with corrosive sublimate; and creatine and creatinine give bundles of needle-shaped crystals. With respect to urochrome or yellow colouring matter, I have frequently found that the largest quantity of *lêth-albumen* has been yielded by urine entirely free from any colouring matter whatever.

I will now describe how I have isolated this substance; also some of its qualities which, in conjunction with a remarkable pathological fact, will, I think, justify the conclusion that the material brought down is mainly of a single and simple nature and constitution. Colour and odour are got rid of in the process.

Having precipitated a sample of urine with the bichloride, the precipitate must then be washed thoroughly, first with tap water, then with

distilled water, till the washings cease to show the presence of urea by Liebig's delicate test of the permanganate of mercury. The precipitate must then be suspended in water, and well treated with sulphuretted hydrogen, till the whole of the mercury is thrown down from the mercuric albuminate in the form of the black sulphide; it is then at once boiled thoroughly and rapidly on a sand bath, to expel the excess of sulphuretted hydrogen; the completeness of this is ascertained by submitting a piece of filter-paper, saturated with a solution of acetate of lead, to the vapour arising from the flask; the black sulphide of lead ceases to form when no sulphuretted hydrogen is given off. The hot solution now contains the *lêth-albumen*, the sulphide of mercury as precipitate, the colouring matters, the hydrochloric acid set free by the decomposition of the bichloride, and the urinary odorous matter. The sulphide of lead is first filtered off; and, to get rid of the hydrochloric acid, the clear solution is precipitated with freshly made basic acetate of lead in excess in the cold. The precipitate consists of a compound of the lead salt with the *lêth-albumen* and insoluble chloride of lead. The supernatant liquor is decanted off, and the precipitate well washed with repeated large quantities of hot water, and kept some time at boiling point on a sand bath. Now, as thirty parts of boiling water will dissolve one part of chloride of lead, it is only necessary to carry out this portion of the process thoroughly to insure the complete removal of the lead chloride. At this part, the odorous bodies are mainly removed, also a considerable portion of the original substance is lost. The manner in which this occurs is interesting, as showing that we have a protein substance in hand. As the liquid evaporates in cooling, a thin insoluble pellicle forms on the surface. A solution of casein, under like circumstances, throws up a similar insoluble pellicle. The remaining plumbic albuminate must now be treated with sulphuretted hydrogen, and the resulting sulphide carefully filtered away before driving off the excess of gas, or otherwise the free acetic acid from the basic acetate would take up a little fresh lead into solution. The filtrate now contains the *lêth-albumen*, a little residuary colouring matter, and free acetic acid; it is now rapidly concentrated on a sand bath, during which a solution of ammonia, in distilled water of the strength of two per cent. only, must be carefully added to neutralise the free acid down to the point of a feeble acid reaction, never allowing it to become alkaline, or the *lêth-albumen* would be rendered insoluble. As the solution concentrates, a portion of the remaining colouring matter is precipitated, consisting of the oxide of iron mixed up with organic substance. The liquor is filtered off, and now contains *lêth-albumen* and acetate of ammonia; it has a faint acid reaction and varying colour. The former can now be precipitated by free addition of absolute alcohol, the acetate of ammonia and the rest of the colouring matter remaining in solution. Appended is a table by which the amount of *lêth-albumen* daily excreted may be ascertained with great facility and simple means, the only article required beyond those which every medical man commonly possesses being a one hundred cubic centimètre tube (price two shillings). This substance is a white flocculent body, of low specific gravity and a slightly acid reaction. As to its chemical composition, the first thing to show is that it contains a large quantity of nitrogen. If a portion of it be placed on a platinum spatula over a Bunsen's burner, it affords the usual evidence of a nitrogenous substance, by giving off the odour of burnt feathers. Then, if a solution of egg-albumen be placed in one of Dr. Russell's urea estimation tubes, and the hypobromous solution added, nitrogen is freely evolved. If a solution of *lêth-albumen* be placed in another tube, and the hypobromous solution added, nitrogen is again freely formed. In order to prove that this gas is really nitrogen, I washed it with a solution of caustic potash, when it did not diminish in bulk; it was therefore neither carbonic acid nor chlorine. A lighted taper was then introduced, when it was immediately extinguished, proving it to be neither hydrogen nor oxygen; it could only then be nitrogen.

In passing, I may say that the above and other experiments show the error in the estimation of urea by either Liebig's method or the hypobromous method. If it be desired to be exact, the *lêth-albumen* can be estimated by the table, and deducted from the result of the urea analysis.

If to a solution of egg-albumen in distilled water a proportionate quantity of acetic acid be added, corrosive sublimate will not produce a precipitate. I am not sure that this point is known. In like manner, if to a solution of *lêth-albumen* in distilled water acetic acid be added, corrosive sublimate will, as before, fail to precipitate. *Lêth-albumen* is a very unstable substance relatively to albumen proper, as is shown by the following experiment. Let a solution of egg-albumen be placed in a dialyser. After a week's immersion, only slight precipitation will be produced in the water of the bath by the permanganate of mercury, and bichloride of mercury will produce none. Then let a solution of *lêth-albumen* be placed in a dialyser; in the course of a few hours, the permanganate will give a free precipitation with the water of the bath, but the

bichloride of mercury, as before, *none*. It is known that egg-albumen will not pass the membrane. It is now proved that lth-albumen, as such, will not pass through. But the sequel is more important still; for, after a few hours' further exposure to air, the solution within the membrane will be wholly deprived of its reaction with bichloride of mercury. The chemical change which thus takes place by this exposure to air suggests that it is oxidation, and that the change is in the direction of urea. Lead, nitrate of silver, bromine, chlorine, chloroform, alcohol, all more or less bring down the substance; but ordinary albumen, when precipitated by alcohol, will not redissolve in water. This, however, will do so, similarly to the two forms of peculiar albumen already mentioned as described by Scherer.

TABLE for estimation of Lth-Albumen. Quantity of Urine required (according to specific gravity) to be made up to 100 Cubic Centimetres with water, to give an uniform specific gravity of 1.010.

Specific gravity	1.010	1.011	1.012	1.013	1.014	1.015	1.016	1.017	1.018	1.019	1.020	1.021	1.022	1.023	1.024	1.025	1.026	1.027	1.028	1.029	1.030
Cubic centimetres of urine required	1.00	91.0	83.3	77.0	71.4	66.7	62.5	58.8	55.6	52.6	50.0	47.6	45.5	43.5	41.7	40.4	38.5	37.1	35.7	34.5	33.3
1 cubic centimetre	.0072	.0079	.0086	.0094	.0101	.0108	.0115	.0122	.0130	.0137	.0144	.0151	.0158	.0166	.0173	.0180	.0187	.0194	.0202	.0209	.0216
2 " " " " " " " " " "	.0144	.0158	.0172	.0188	.0202	.0216	.0230	.0244	.0260	.0274	.0288	.0302	.0316	.0332	.0346	.0360	.0374	.0388	.0404	.0418	.0432
3 " " " " " " " " " "	.0216	.0237	.0258	.0282	.0303	.0324	.0345	.0366	.0390	.0411	.0432	.0453	.0474	.0498	.0520	.0540	.0561	.0582	.0606	.0627	.0648
4 " " " " " " " " " "	.0288	.0316	.0344	.0376	.0404	.0432	.0460	.0488	.0520	.0548	.0576	.0604	.0632	.0664	.0692	.0720	.0748	.0776	.0808	.0836	.0864
5 " " " " " " " " " "	.0360	.0395	.0430	.0470	.0505	.0540	.0575	.0610	.0650	.0685	.0720	.0755	.0790	.0830	.0865	.0900	.0935	.0970	.1010	.1045	.1080
6 " " " " " " " " " "	.0432	.0474	.0516	.0564	.0606	.0648	.0690	.0732	.0780	.0822	.0864	.0906	.0948	.0998	.1038	.1080	.1122	.1164	.1212	.1254	.1296
7 " " " " " " " " " "	.0504	.0553	.0602	.0658	.0707	.0756	.0805	.0854	.0910	.0959	.1008	.1057	.1106	.1162	.1211	.1260	.1309	.1358	.1414	.1463	.1512
8 " " " " " " " " " "	.0576	.0632	.0688	.0752	.0808	.0864	.0920	.0976	.1040	.1096	.1152	.1208	.1264	.1328	.1384	.1440	.1496	.1552	.1616	.1672	.1728
9 " " " " " " " " " "	.0648	.0711	.0774	.0846	.0909	.0972	.1035	.1098	.1170	.1233	.1296	.1359	.1422	.1494	.1557	.1620	.1683	.1746	.1818	.1881	.1944
10 " " " " " " " " " "	.0720	.0790	.0860	.0940	.1010	.1080	.1150	.1220	.1300	.1370	.1440	.1510	.1580	.1660	.1730	.1800	.1870	.1940	.2020	.2090	.2160
11 " " " " " " " " " "	.0792	.0869	.0946	.1034	.1111	.1188	.1265	.1342	.1430	.1507	.1584	.1661	.1738	.1826	.1903	.1980	.2057	.2134	.2222	.2299	.2376
12 " " " " " " " " " "	.0864	.0948	.1032	.1122	.1212	.1296	.1380	.1464	.1560	.1644	.1728	.1812	.1896	.1982	.2066	.2160	.2244	.2328	.2424	.2508	.2592
13 " " " " " " " " " "	.0936	.1027	.1118	.1222	.1313	.1404	.1495	.1586	.1690	.1781	.1872	.1963	.2054	.2158	.2249	.2340	.2431	.2522	.2626	.2717	.2808
14 " " " " " " " " " "	.1008	.1106	.1204	.1316	.1414	.1512	.1610	.1708	.1820	.1918	.2016	.211	.2212	.2324	.2422	.2520	.2618	.2716	.2828	.2926	.3024
15 " " " " " " " " " "	.1080	.1185	.1290	.1410	.1515	.1620	.1725	.1830	.1950	.2055	.2160	.2265	.2370	.2480	.2585	.2690	.2805	.2910	.3030	.3135	.3240
16 " " " " " " " " " "	.1152	.1264	.1376	.1504	.1616	.1728	.1840	.1952	.2080	.2192	.2304	.2416	.2528	.2656	.2768	.2880	.2992	.3104	.3232	.3344	.3456
17 " " " " " " " " " "	.1224	.1343	.1462	.1598	.1717	.1836	.1955	.2074	.2210	.2329	.2448	.2567	.2686	.2822	.2947	.3066	.3179	.3298	.3434	.3553	.3672
18 " " " " " " " " " "	.1296	.1422	.1548	.1692	.1818	.1944	.2070	.2196	.2340	.2466	.2592	.2736	.2869	.3002	.3154	.3287	.3400	.3533	.3686	.3819	.3961
19 " " " " " " " " " "	.1368	.1501	.1634	.1786	.1919	.2052	.2185	.2318	.2470	.2603	.2736	.2879	.3020	.3160	.3320	.3460	.3600	.3760	.3880	.4040	.4180
20 " " " " " " " " " "	.1440	.1580	.1720	.1880	.2020	.2160	.2300	.2440	.2600	.2740	.2880	.3020	.3160	.3320	.3460	.3600	.3760	.3920	.4070	.4230	.4380
21 " " " " " " " " " "	.1512	.1659	.1806	.1974	.2121	.2268	.2415	.2562	.2730	.2877	.3024	.3171	.3318	.3486	.3633	.3780	.3927	.4074	.4242	.4389	.4536
22 " " " " " " " " " "	.1584	.1738	.1892	.2068	.2222	.2376	.2530	.2684	.2860	.3014	.3168	.3322	.3476	.3652	.3806	.3960	.4114	.4268	.4444	.4598	.4752
23 " " " " " " " " " "	.1656	.1817	.1978	.2162	.2323	.2484	.2645	.2806	.2990	.3151	.3312	.3473	.3634	.3818	.3979	.4140	.4301	.4462	.4646	.4807	.4968
24 " " " " " " " " " "	.1728	.1896	.2064	.2256	.2424	.2592	.2760	.2928	.3120	.3288	.3456	.3624	.3792	.3984	.4152	.4348	.4488	.4650	.4816	.5010	.5184

RULES.—If urine contain a deposit of urates, it must be filtered off. If the urine be very acid, reduce it faintly acid by weak liquor potassae. If alkaline, make faintly acid with acetic acid. If the specific gravity be higher than 1.010, reduce that standard as per table; if lower, raise it by adding a little common salt. 5 cubic centimetres of cold saturated solution of bichloride of mercury to be added to 100 cubic centimetres to precipitate the lth-albumen; mix thoroughly in a 100 cc. graduated tube. The specimen should stand in a quiet place at about 60 Fahr. for twenty-four hours; tap the tube to detach any flakes adhering to the sides; read off the number of c.c. of deposit and refer to table. If the urine contain albumen, bring a quantity of it to specific gravity 1.010; heat sufficiently to coagulate the albumen; cool, filter off 100 cubic centimetres, and, if necessary, bring back to specific gravity 1.010 with common salt. If a rare form of abnormal albumen be present, and it is necessary to use nitric acid to assist in its precipitation, it must be afterwards barely neutralised with potash. If it be desired to ascertain the amount of lth-albumen excreted in twenty-four hours, the figures in the table must be multiplied by the number of cubic centimetres of urine passed in the time, inserting the decimal points. If it be desired to know the amount in grains, further multiply by 15.5.

The relation which the ultimate analysis of this substance bears to albumen and urea is given below in percentage composition after deducting the ash. The figures for albumen are taken from Galloway's *Qualitative Analysis*; and for urea, from Parkes.

	Albumen.	L��th-albumen.	Urea.
Carbon	54.28	34.52	20.00
Hydrogen ...	7.33	5.71	6.66
Oxygen	22.40	47.19	26.67
Nitrogen!.....	15.99	12.58	46.67
	100.00	100.00	100.00

If we compare this with albumen, we see that the chief point of difference is the larger proportion of oxygen. Theoretically, if we add a certain portion of oxygen to a certain portion of albumen, there might be formed so much lth-albumen, carbonic acid, and water; and by adding oxygen to the quasi-albumen, so many parts of urea, carbonic acid, and water. The above analysis has been most carefully made. Albumen has been converted into urea, it has been stated, by oxidation with permanganate of potash. By dissolving lth-albumen in water from its alcoholic precipitation, it can be again thrown down by bichloride of mercury.

Average Elimination in Health.—If the fluctuations of urea are puzzling, those of lth-albumen are yet more so; the quantity eliminated rises or falls suddenly 100 or 150 per cent. If lth-albumen were merely an arrest in the elaboration of the albuminoid elements into urea, it might be expected that on those days when its excretion was at a low ebb the urea would show a corresponding increase, and *vice versa*. This relation does not, in fact, obtain, thus showing an independency of origin.

In order to get an approximative estimate of its mean daily excretion, I have taken 100 consecutive estimations from my records pertaining to

ten adults, male and female together. This gives a daily average of 2.169 grammes, = 33.48 grains, containing in the figures such extremes as 10 and 76 grains. There are reasons for thinking, however, that this estimate will ultimately be found too low. The method of estimation adopted will appear by means of the appended table. In the first place, an analysis was made of the mercuric precipitate from similar quantities of several different urines; and this was found to give an average of nitrogenous substance in combination of 31.922 per cent. The next step was to ascertain the relation of bulk to weight of the precipitate. Four different samples of urine were reduced to an exact uniformity of condition, and precipitated with a fixed quantity of the sublimate in a one hundred cubic centimetres measure. After standing twenty-four

hours, the number of cubic centimetres of deposit in each case was read off and recorded; each precipitate was then separately washed and dried in a closed water-bath till it ceased to lose weight. A calculation was then made of the mean weight of the four samples per cubic centimetre of deposit, and then its contained proportion of chemically dried nitrogenous substance. This proved equal to .0072 gramme, which accordingly occupies the top of the first column in the table.

I will now state an interesting practical fact in connection with this substance. In cases of chronic Bright's disease, the elimination of lth-albumen is materially diminished; not so in the acute form. Although there may be a large proportion of albumen present in the urine, there is at first no decrease in the allied substance; but as the case becomes more and more chronic, it gradually diminishes, and in the end becomes altogether extinct. This observation is founded upon the examination of about a dozen cases. The chemical examination of the substance itself has absorbed so much time, that I am unable to state whether this singular disappearance is confined to certain forms of kidney-disease, or is common to all forms of Bright's disease in the late stages. Something more may shortly be ascertained upon the point, but of the bare fact there is no doubt whatever. As to the cause of its disappearance, if a blind conjecture may be permitted, it might be accounted for as follows. The blood having been weakened of its albumen, it affords a lessened opportunity for oxidation of albumen; and, synchronously with this, the urea-forming function continuing active, and seizing upon every available atom of oxygen for its purpose, where this is already scarce, may still further diminish the chance of oxidation. Again, by slow degrees in Bright's disease, the urea in the blood is increased, till finally it becomes so abundant in the later stages as to produce this non-oxidation by mechanical envelopment.

If the lth-albumen were retained in the blood all formed, as is urea, it would give at least a trace of its existence in the urine, as does the latter. On these grounds, it might be judged not to be formed at all,

and so is absent. But the real cause of this absence may be far more recondite and of more practical consequence than we can yet guess. So far I have been unable to discover any other disease in which this precipitation is absent, though somewhat numerous observations have been made. There is, however, one abnormal condition which will prevent the precipitation of the substance though it exist. This is extremely rare; I have met with but one case; it was where the urine was inordinately acid. This difficulty was overcome by carefully reducing the acidity with potash to the point of only normal acidity, when the lth-albumen was immediately precipitated; upon adding the corrosive sublimate, it was lth-albumen, not calomel. Once only has estimation by the table failed. It was in a case of albuminuria dependent upon obscure brain-disease. Here the lth-albumen duly appeared, but was of such a nature that it remained suspended in the urine, and could not be estimated. I have yet to learn whether in other cases of the kind the same phenomenon would occur. In some other pathological states, I find the substance very greatly increased. In one sample, there were present over a hundred and fifty grains for the twenty-four hours. This was in a case of general paresis, under the care of Dr. James Johnston.

To summarise: It is clear that this substance comes from the body of the extractives, which have been variously estimated at from two hundred to three hundred grains. I do not assume that I have absolutely proved an unity of nature in this material; but I have given some fair reasons for that opinion; and also that it is a modified form of albumen. The fact that one disease stops the whole of it from being formed, would seem to infer that it has one origin at any rate. If it in reality consist of several substances, or of different origins, it is yet more curious and more inexplicable. I prefer the simpler hypothesis.

Since writing the above paper, I have met with a small-type addendum in "Neubauer and Vogel" (New Sydenham Society), which affords further evidence to strengthen my views. It is as follows, page 70. "Baylon describes, under the name of 'albumenose', a substance which, according to him, is also present in healthy urine." This substance, Mialhe tells us, conducts itself in reference to albumen as does glucose to starch." It further says, "that in a case of Bright's disease containing much albumen, no albumenose was present".

THE DIAGNOSTIC VALUE OF ALBUMINURIA.

By ROBERT SAUNDBY, M.D. Edin., M.R.C.P. Lond.,
Assistant-Physician to the General Hospital, Birmingham.

THE presence of albumen in the urine is generally regarded as indicative of renal disease, especially when it is persistent and is not the accompaniment of more prominent pathological conditions, such as fever, severe inflammatory diseases, or affections of the circulatory system. Albuminuria dependent on local affections of the excretory urinary organs is, of course, excluded.

I have examined the urine of one hundred and forty-five male patients taken *seriatim* as they presented themselves before me in the outpatient department, and of this number no fewer than one hundred and five contained albumen in more or less quantity, easily demonstrated by boiling and adding a drop or two of acetic acid. I have arranged these cases in the following table.

The table shows the ages of the patients and the pathological conditions which determined or coincided with albuminous or non-albu-

minous urine. When I could, I have referred the albuminuria to renal disease. Sixty-six of the cases are tabulated as granular kidney, and one as fatty kidney, or chronic parenchymatous nephritis. The number of cases of granular kidney seems a large proportion; but their symptoms were carefully investigated before a diagnosis was made, and the proportion (sixty-six to a total of three hundred and fifty men, women, and children) does not much exceed the *post mortem* room statistics of the General Hospital. All who have had pathological experience in this town admit the extreme frequency of this form of kidney-disease.

Under the head Debility, I have classed cases complaining of weakness, in whom no definite pathological changes could be discovered. I may say the same of Dyspepsia; and with these I would group two cases of acne, making in all thirty-two cases, of which seventeen had albumen in their urine. One of these cases of debility was after typhoid fever: a condition in which it sometimes happens that actual renal degeneration occurs, although Bartels scarcely admits it (Ziemssen's *Cyclopaedia*, English translation, vol. xv, p. 54). Within the last six months, I have seen three cases of albuminuria after typhoid fever. In one of these, the urine presented all the characters of parenchymatous nephritis, and there was dropsy; in the others, the symptoms were those of debility with albuminuria. Some of the cases of debility resemble clinically the type described by Dr. Moxon (*Guy's Hospital Reports*, Third Series, vol. xxiii, "The Albuminuria of Adolescents"); while others, in their age and general symptoms, are more closely allied to the class of cases described by Dr. Clement Dukes (*BRITISH MEDICAL JOURNAL*, Nov. 30th, 1878, "The Albuminuria of Puberty"); but in others there was nothing characteristic, and to all appearance they were and are healthy young men who were suffering from some very temporary derangement.

Since the observations of Professor Leube of Erlangen (*Virchow's Archiv*, Band 72, Heft 2, "Ueber die Ausscheidung von Eiweiss in Harn des gesunden Menschen"), we must believe that transient albuminuria may occur in perfectly healthy persons; and Dr. Moxon and Dr. Dukes have told us how persistent it may be under the conditions they have described. I have tested these urines on each appearance of the patients, and have proved its persistence for weeks and months. The microscopical examination has revealed usually nothing. In one or two cases, there were a few oxalates; and in one or two a few hyaline casts; but the latter especially were quite exceptional, and, as we know, they are of no pathological significance. As the urine examined was always the after-breakfast urine, passed in my presence, I thought it desirable to investigate the conditions more closely; and, by the kindness of Dr. Wade and Dr. Foster, I admitted two youths aged respectively 15 and 17, and had them under observation for some weeks. The urine was examined as passed after breakfast, after dinner, after tea, and during the night, and under varying conditions of diet, absolute milk-diet and complete rest in bed being enforced for some days. The result was to prove that the albuminuria did not depend solely upon diet or exercise; for, though complete rest and milk-diet diminished the quantity, they did not cause it to disappear, and on leaving the hospital the state of the urine was just the same as on admission. As I have had it suggested to me by more than one friend that spermatorrhoea might account for this symptom, I must be allowed to point out that the seminal and prostatic fluids do not contain any albuminous body coagulable by heat (Simon), and that the sole ground for believing in this as a source of fallacy is an exceptional case observed by Dr. Bence Jones, and specially recorded as exceptional; while in none of my cases has there been any flocculent deposit like

TABLE.—Diseases.

Age.	Granulr. Kidney.		Debility.		Dyspepsia.		Phthisis.		Morbus Cordis.		Epilepsy.		Syphilis.		Bronchitis.		Tonsillitis, subac. and chronic.		Chorea.	Laryngitis.	Tania.	Acne.	Erythema.	Gout.	Stricture of Urethra.	Esophagus.	Lumbago.	Fatty Kidney.	Jaundice.	Total.	Percentage with Albuminuria.		
	Alb.	Ex Alb.	Alb.	Ex Alb.	Alb.	Ex Alb.	Alb.	Ex Alb.	Alb.	Ex Alb.	Alb.	Ex Alb.	Alb.	Ex Alb.	Alb.	Ex Alb.	Alb.	Ex Alb.	Alb.	Alb.	Alb.	Alb.	Ex Alb.	Ex Alb.	Ex alb.	Ex Alb.	Alb.	Alb.	Alb.	Alb.	Ex Alb.	Ex Alb.	
10 to 20..	0	0	5	4	2	1	1	0	3	1	0	1	0	0	1	0	1	0	2	1	0	2	0	0	0	0	0	0	1	18	3	69.2	
20 to 30..	1	0	2	1	5	6	1	0	2	0	1	0	0	1	0	1	1	2	0	0	1	0	1	0	0	0	0	0	14	12	53.8		
30 to 40..	11	2	0	0	1	3	4	1	0	2	0	1	2	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	18	12	60.0		
40 to 50..	18	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	21	2	91.3		
50 to 60..	20	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	21	4	84.0		
60 to 70..	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	12	2	85.7		
70 to 80..	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100.0		
Totals..	63	3	7	5	8	10	7	2	6	3	1	2	2	1	2	7	2	2	2	1	1	2	1	1	1	1	1	1	105	40	72.4		