change, the actinic rays being altogether the most effective.* Mr. E. Budde has recently described a remarkable experiment in this direction. He found that a differential thermometer filled with chlorine expanded about seven times more in the violet than in the red ray of the solar spectrum; when the same thermometer was filled with CO_2 no action was noticed.†

As the combination of hydrogen and chlorine is effected without change of volume, it is obvious that the molecule *el* does not unite with the molecule *ed*, forming a compound molecule *el-ed*. The conclusion is therefore unavoidable that each molecule has been divided into two equal parts, and that by affinity, like parts have been separated, and unlike parts have been united. These parts are the smallest quantities that can be isolated, and are in fact the atoms recognised by the chemist. If this smallest combining proportion or atom be designated by *a*, the actual composition of the hydrogen molecule *el*, weighing 2, may be clearly represented by *al-al* (weight 1 + 1), and the chlorine molecule *ed* weighing 72, by *ad-ad* (weight 35·5 + 35·5). As the attraction of *al* to *al*, and of *ad* to *ad* is, after exposure to light, less than of *al* to *ad*, there is an instantaneous chemical change by which one molecule of hydrogen and one molecule of chlorine are transformed into two molecules of hydrochloric acid gas. This reaction is clearly indicated by the following equation: *al-al* + *ad-ad* = *alad* + *alad* = 2 *alad*.

The symbols here used are intended to convey to the mind an idea of the relative size of combining parts, which is not so apparent when expressed as follows:—

$$H_2 + Cl_2 = HCl + HCl = 2\,HCl.$$

From the simplest of molecular types we might proceed to the most complex; and, throughout, if we consider the combining proportion of each simple constituent as either a unit or a multiple of a unit, the composition of each molecule may be expressed by whole numbers. Thus having as many different kinds of units as there are elements, any true chemical combination may be symbolised by a combination of arithmetical ratios. This method, under the light of the atomic theory, clearly reveals the harmonic relations of molecular constituents, which, seen from the stand-point of percentage composition, appear unconnected and discordant.

It must be admitted that many of the reactions of well-known bodies have not yet been determined quantitatively; yet were they made out, we should not be able to demonstrate by experiment the truth of the atomic doctrine. It still remains a theory, in favour of which there are many facts and phenomena that collectively form an argument not easily to be outweighed. This evidence may be briefly summarised as follows:—

1. *Atomic Weights.* Elements combine in extremely minute parts, according to the law of definite and multiple proportions. The atomic weight of an element is either its equivalent weight or a multiple of it, as such multiple cannot be divided by reactions, its weight must conform with the atomic number. Whatever changes of position the combining weight of an element may undergo in a series of molecular metamorphoses, that is to say, however many times it may be displaced and replaced in chemical combinations, it invariably retains its characteristic weight. This invariability of weight is an essential property of the atom.

2. *Atomic Volume.* Gases unite in equal volumes or multiple volumes. If hydrogen be taken as unity, the density of each elementary gas is identical with the weight of its atom. The atomic volume, determined by dividing the atomic weight of a body by its specific gravity, has been the means of revealing many interesting relations among compounds of similar structure, and among many containing different components and of unlike structure.

3. *Atomic Heat.* It has been shown by experiment that quantities of each element conforming with its atomic number have the same capacity for heat, excepting only carbon, boron, and silicon; these, it is believed, will yet be found to conform to the law, that the specific heats of atoms are the same. This law is regarded as a direct confirmation of atomic weights.

4. *Molecules.* According to the atomic theory chemical forces are brought in equilibrium when atoms combine and form a molecule. Every gas and every vapour undecomposed has a density proportional to its molecular weight. All known molecular combinations and combining proportions are in accordance with the atomic doctrine. Decomposition by electrolysis affords some evidence that the constituent parts of a molecule which are simultaneously separated are proportionate to atomic weights.

5. *Atomic combining capacity.* The modern doctrine of types and substitutions is solely based on the individuality of the atom, without which the whole fabric of typical structures must fall.

6. *Isomerism.* The fact that bodies containing the same elements, and in precisely the same proportions, exhibit different properties, has been thus far accounted for, only on the supposition that atoms are differently arranged in each body. These differences in arrangement depend not only on the relative position of atoms, but also on the order as to time in which they combine; for two or more atoms having such precedence over others as to combine first, may, by that means, form a radical of such permanence as to play the part of an atom. Apart from the question of radicals, we may ascertain the number of different bodies which can be formed from the same number of different atoms, by an application of the mathematical law of permutations.

7. *Homogeneity.* The uniformity of structure and appearance of any element or chemical combination of elements furnishes the most palpable proof of the identity in size and shape of those definite parts which we designate as molecules. This homogeneity is retained under different degrees of pressure, thus making it apparent that molecules are not identical in structure, but that they approach and recede in precisely the same manner under the same conditions.

Finally.—The foregoing statement regarding the existence of atoms which are indivisible and indestructible under the present order of things does not preclude the supposition that the atom may be a cluster of smaller particles held together by a powerful affinity, which, when counteracted, would leave them free to move within a given sphere. On this assumption it is highly probable that the relative position of such particles may modify the combining capacity of the atom. Moreover, the normal motion of such particles may determine not only the peculiarities of elemental spectra, but produce other effects not dependent on the amplitude of atomic oscillations, thus favouring the inference that the atom itself is a receptacle of force.

SAMUEL D. TILLMAN

* A Treatise on the Forces which produce the Organisation of Plants. By John William Draper. (New York: Harper and Brothers, 1843.)

† *Pogg. Annalen* for 1871, No. 10.

BLOOD-RELATIONSHIP *

I PROPOSE in this memoir to deduce by fair reasoning from acknowledged facts a more definite notion than now exists of the meaning of the word "kinship." It is my aim to analyse and describe the complicated connection that binds an individual, hereditarily, to his parents and to his brothers and sisters, and, therefore, by an extension of similar links, to his more distant kinsfolk. I hope by these means to set forth the doctrines of heredity in a more orderly and explicit manner than is otherwise practicable.

From the well-known circumstance that an individual may transmit to his descendants ancestral qualities which he does not himself possess, we are assured that they could not have been altogether destroyed in him, but must have maintained their existence in a latent form. Therefore each individual may properly be conceived as consisting of two parts, one of which is latent and only known to us by its effects on his posterity, while the other is patent and constitutes the person manifest to our senses.

The adjacent, and, in a broad sense, separate lines of growth in which the patent and latent elements are situated, diverge from a common group and converge to a common contribution, because they were both evolved out of elements contained in a structureless ovum, and they jointly contribute the elements which form the structureless ova of their offspring.

The annexed diagram illustrates my meaning, and serves to show clearly that the span of each of the links in the general chain of heredity extends from one structureless stage to another, and not from person to person.

Structureless elements in Father	.....Adult Father	Structureless elements in offspring.
	.....Latent in Father.....	

I will now proceed to consider the quality of the several relationships by which the above terms are connected together.

The observed facts of Reversion enable us to prove that the latent elements must be greatly more varied than those that are personal or patent. The arguments are as follows:—(1) There

* Read before the Royal Society, June 13, by Francis Galton, F.R.S.

must be room for very great variety, because a single strain of impure blood will reassert itself after more than eight generations; (2) an individual has 256 progenitors in the eighth degree, if there have been no ancestral intermarriages, while under the ordinary conditions of social and neighbourly life, he will certainly have had a considerable, though a smaller, number of them; (3) the gradual waning of the tendency to reversion as the generations increase, conforms to what would occur if each fresh marriage contributed a competing element for the same place, thus diluting the impure strain until its relative importance was reduced to an insignificant amount. It follows from these arguments that for each place among the personal elements there may exist, and probably often does exist, a great variety of latent elements that formerly competed to fill it.

I have spoken of the primary elements as they exist in the newly-impregnated ovum, where they are structureless, but contain the materials out of which structure is evolved. The embryonic elements are segregated from among them. On what principle are they segregated? Clearly it is on some principle whose effects are those of "Class Representation," using that phrase in a perfectly general sense, as indicating a mere fact, and avoiding any hypothesis or affirmation on points of detail, about most, if not all, of which we are profoundly ignorant. I give as broad a meaning to the expression as a politician would give to the kindred one, a "representative assembly." By this he means to say that the assembly consists of representatives from various constituencies, which is a distinct piece of information so far as it goes, and is a useful one, although it deals with no matter of detail; it says nothing about the number of electors, their qualifications, or the motives by which they are influenced; it gives no information as to the number of seats; it does not tell us how many candidates there are usually for each seat, nor whether the same person is eligible for, or may represent at the same time, more than one place, nor whether the result of the elections at one place may or may not influence those at another (on the principle of correlation). After these explanations there can, I trust, be no difficulty in accepting my definition of the general character of the relation between the embryonic and the structureless elements, that the former are the result of election from the latter on some method of Class Representation.

The embryonic elements are *developed* into the adult person. "Development" is a word whose meaning is quite as distinct in respect to form, and as vague in respect to detail, as the phrase we have just been considering; it embraces the combined effects of growth and multiplication, as well as those of modification in quality and proportion, under both internal and external influences. If we were able to obtain an approximate knowledge of the original elements, statistical experiences would no doubt enable us to predict the average value of the form into which they would become developed, just as a knowledge of the seeds that were sown would enable us to predict in a general way the appearance of the garden when the plants had grown up. But the individual variation in each case would be great, owing to the large number of variable influences concerned in the process of development.

The latent elements in the embryonic stage must be developed by a parallel, I do not say by an identical process, into those of the adult stage. Therefore, to avoid all chance of being misapprehended when I collate them, I will call, in the diagram I am about to give, the one process "Development (*a*)" and the other "Development (*b*)."

It is not intended to affirm, in making these subdivisions, that the embryonic and adult stages are distinctly separated; they are continuous, and it is impossible but that they should overlap, some elements remaining embryonic while others are completely formed. Nevertheless the embryo, speaking broadly, may fairly be looked upon as consecutive.

Again, the two processes are not wholly distinct; on the contrary, the embryo, and even the adult in some degree, must receive supplementary contributions derived from their contemporary latent elements, because ancestral qualities indicated in early life frequently disappear and yield place to others. The reverse process is doubtful; it may exist in the embryonic stage, but it certainly does not exist in a sensible degree in the adult stage, else the later children of a union would resemble their parents more nearly than the earlier ones.

Lastly, I must guard myself against the objection, that though structure is largely correlated, I have treated it too much as consisting of separate elements. To this I answer, first, that in describing how the embryonic were derived from the structureless elements, I expressly left room for a small degree of correlation; secondly, that in the development of the adult elements of the embryonic, there is a perfectly open field for natural selection, which is the agency by which correlation is mainly established; and thirdly, that correlation affects groups of elements, and not the complete person, as is proved by the frequent occurrence of small groups of persistent peculiarities, which do not affect the rest of the organism, so far as we know, in any way whatever.

The ground we have already gained may be described as follows:—

Out of the structureless ovum the embryonic elements are taken by Class Representation, and these are developed (*a*) into the visible adult individual. On the other hand, returning to our starting-point at the structureless ovum, we find, after the embryonic elements have been segregated, the large residue is developed (*b*) into the latent elements contained in the adult individual. All this is summarily expressed in the first two columns of the diagrams below. I might have inserted vertical arrows to show the minor connections between the corresponding stages in the two parallel processes, but it would have complicated the figure.

In what way do the patent and latent adult elements respectively contribute representatives towards the structureless stage of the next generation? We know that every quality they possess may be transmitted to it, but it does not follow that they are invariably transmitted. The contributions from the patent elements cannot be by "Class," because their own original elements have been themselves specialised, and therefore can contain no more than one or a few members of each class (which, it is true, must have been somewhat developed, both in numbers and variety). Their contributions may therefore be justly described as being effected on some principle that has resulted in a "Family representation," though whether in a strictly universal representation I do not profess to say.

As regards the large variety of adult latent elements, they cannot all be transmitted, for the following obvious reason; the corresponding qualities of no two parents can be considered exactly alike; therefore the accumulation of sub-varieties, if they were all preserved, as the generations rolled onwards, would exceed in multitude the wildest flights of rational theory. The heritage of peculiarities through the contributions of 1,000 consecutive generations, even supposing a great deal of ancestral intermarriage, must far exceed what could be packed into a single ovum. The contributions from the latent adult elements are therefore no more than representative; but we know they cannot be so on the broad principle of "class representation," if the word "class" be applied to the same large orders as before, and if the representatives are few in number, because it is incumbent on them to furnish all the various members of each Class whence the representatives have to be drawn. Therefore, bearing in mind what has been just argued, that it is impossible for the elements of every individual quality to be contributed, we are driven to suppose, as in the previous case, a "Family Representation," the similar elements contributed by the two parents ranking, of course, as of the same family. It is most important to bear in mind that this phrase states a fact and not an hypothesis; it does not mean that each and every Family has just one representative, for it is absolutely reticent on all matters of detail, such as those I enumerated, when speaking of Class Representation. To show the importance which I attach to this disclaimer, I may be permitted to mention what appears to me the most probable *modus operandi*, namely, that it is in reality a large selection made on a broader and not a narrower system than that of classes, and similar to that obtained by an indiscriminate conscription; thus, if a large army be drawn from the provinces of a country by a general conscription, its constitution, according to the laws of chance, will reflect with surprising precision the qualities of the population whence it was taken; each village will be found to furnish a contingent, and the composition of the army will be sensibly the same as if it had been due to a system of immediate representation from the several villages.

The following diagram expresses the whole of the foregoing results:—It begins with the structureless elements, whence the parent individual was formed, and ends with its contributions to the structureless elements, whence his offspring is formed.

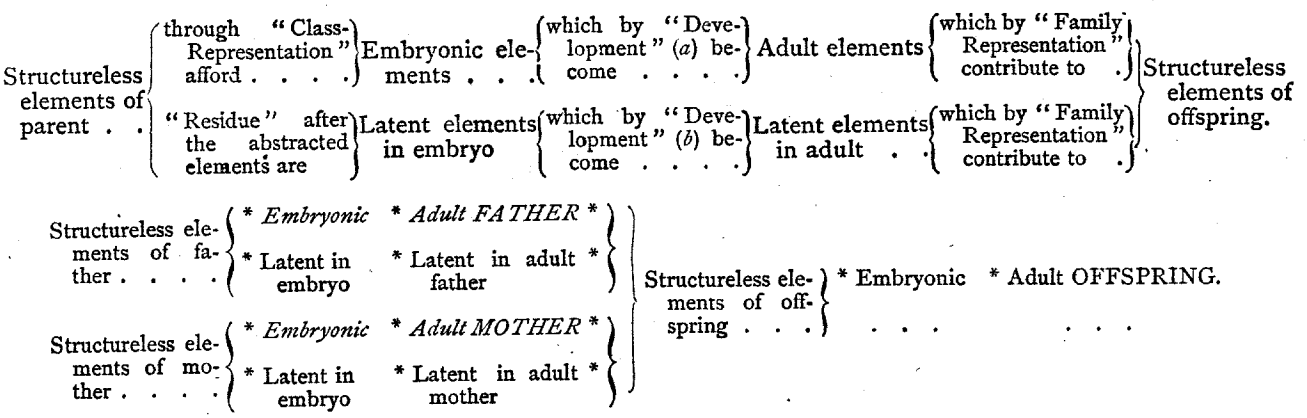
I will now inquire, what are, roughly speaking, the relative proportions of the contributions to the elements of the offspring made respectively by the patent and latent elements of the adult parent? It is better not to complicate the inquiry by speaking, at first, of these elements in their entirety, but rather of some

special characteristic; thus, to fix the ideas, suppose we are speaking about a peculiar skin-mark in an animal. The peculiarity in question may be conceived (1) as purely personal, without the concurrence of any latent equivalents, (2) as personal but conjoined with latent equivalents, and (3) as existent wholly in a latent form. It can be shown that, in the first case, the power of hereditary transmission is exceedingly feeble, for notwithstanding some exceptions (as in the lost power of flight in domestic birds), the effects of the use and disuse of limbs, and those of habit, are transmitted to posterity in only a very slight degree. Again, it can be fairly argued that many classes of cases which seem at first sight to fall under case (1), that is, to be purely personal, and to prove a larger hereditary influence than what I assign to it, do really belong to case (2). Thus, when individuals born with a peculiar mark are reputed to be the first of their race in whom it had ever appeared, it would be hazardous in the extreme to argue that the latent elements of that mark were wholly deficient in them. It is very remarkable (I was indebted for a knowledge of this fact to Mr. Tegetmeier) how nearly every bar or spot found in any species of an animal in its wild state may be bred into existence in the domesticated variety of that species; showing that the elements of all these bars and spots are universally present in all varieties of the species, though their manifestation may be overborne and suppressed. We therefore see that the hereditary influences of an animal with respect to any particular spot are, I will not say in every case, but certainly on the average of many cases, much more numerous than if that spot had been purely a personal characteristic, without the concurrence of any latent elements. Bearing this argument in mind, we shall more justly estimate the import of the statistical evidence to be obtained from breeders of animals. I should judge from the impression left by many scattered statistics that it is perfectly safe to affirm that breeders, when they mate two animals, each having the same unusual characteristic, not through known hereditary transmission, but by supposed variation, would consider themselves fortunate if one quarter of the progeny inherited that quality. Now these successful cases are, as I have shown, on the average, the produce of parents having the peculiarity not only in a personal, but also, to some degree, in a latent form. We may therefore reasonably conclude that, had the latter portion been non-existent, the ratio of successful cases would have been materially diminished.

I should demur on precisely the same grounds to objections based on the fact of the transmission of qualities to grandchildren being more frequent through children who possess those qualities than through children who do not; for I maintain that the personal manifestation is on the average, though it need not be so in every case, a certain proof of the existence of some latent elements.

Having proved how small is the power of hereditary transmission of the personal elements, we can easily show how large is the transmission of the purely latent elements, in the case (3) by appealing to the well-known facts of reversion; but into these it is hardly necessary for me to enter at length. The general and safe conclusion is that the contribution from the patent elements is very much less than from the latent ones.

If we now combine our results into a single diagram, showing the fainter stream of heredity by *italic lines*, and indicating those processes by asterisks (*) which were described at length in the previous figure, we shall easily recognise the complexity of hereditary problems. We see that parents are very indirectly



and only partially related to their own children, and that there are two lines of connection between them, the one of large and the other of small relative importance. The former is a collateral kinship and very distant, the parent being descended through two stages (two asterisks) from a structureless source, and the child (so far as that parent is concerned) through five totally distinct stages from the same source. The other, but unimportant line of connection, is direct, and connects the child with the parent through two stages. We shall therefore wonder that, notwithstanding the fact of an average resemblance between parent and child, the amount of individual variation should not be much greater than it is, until we have realised how complete must be the harmony between every variety and its environments, in order that the variety should be permanent.

We also infer from the diagram how near, and yet how subject to variation, is the kinship between the children of the same parents; for only two stages are required to trace back their descent to a common origin, which, however, proceeds from four separate streams of heredity, namely, the adult patent and latent elements of each of the two parents.

An approximate notion of the nearest conceivable relationship between a parent and his child may be gained by supposing an urn containing a great number of balls, marked in various ways, and a handful to be drawn out of them at random as a sample. This sample would represent the person of a parent. Let us now suppose the sample to be examined, and a few handsful of new balls to be marked according to the patterns of those found in the sample, and to be thrown along with them back into the urn. Now let the contents of another urn, representing the influences of the other parent, to be mixed with those of the first. Lastly, suppose a second sample to be drawn out of the combined contents of the two urns, to represent the offspring. There can be no nearer connection justly conceived to subsist between the parent and child than between the two samples; on the contrary, my diagram shows the relationship to be in reality much more remote, and consisting of many consecutive stages, and therefore hardly to be expressed by such simple chances. Whenever the balls in the urns are much of the same pattern, the samples will be alike, but not otherwise. The offspring of a mongrel stock necessarily deviate in appearance from each other and from their parents.

We cannot now fail to be impressed with the fallacy of reckoning inheritance in the usual way, from parents to offspring, using those words in their popular sense of visible personalities. The span of the true hereditary link connects, as I have already insisted upon, not the parent with the offspring, but the primary elements of the two, such as they existed in the newly impregnated ova whence they were respectively developed. No valid excuse can be offered for not attending to this fact, on the ground of our ignorance of the variety and proportionate values of the primary elements. We do not mend matters in the least, but we gratuitously add confusion to our ignorance, by dealing with hereditary facts on the plan of ordinary pedigrees—namely, from the persons of the parents to those of their offspring.

It will be observed that, owing to the clearer idea we have now obtained of the meaning of kinship and of the consecutive phases of the chain of life, the various causes of individual variation can be easily and surely sorted into their proper places. I will mention a few of them, merely as examples.

In the segregation of the embryonic elements, if the structure-

less ones be diverse without any strongly preponderating element, it is impossible to foresee the character of the embryo, just as it is impossible to foresee the character of a handful chosen from an urn containing a mixed assemblage of variously coloured balls. But if they be not diverse, then the embryonic elements will be a true sample of the structureless ones, the conditions of purity of blood are fulfilled, and the offspring will resemble its parents.

We also see, in the process by which the embryonic elements are obtained, how the curious phenomenon may occur of inheritance occasionally skipping alternate generations. The more that has been removed from the structureless group for the supply of the embryonic (which as we have seen, in a nearly sterile destination) the less remains for the latent group, too little, it may be, to assert itself by that, the only prolific, line of transmission. In the supposed case it would recuperate itself during the succeeding generation, where the elements in question will have remained wholly latent, owing to their insignificance in the structureless stage of that generation, which would be sufficient to secure any portion of it from selection for the embryonic form.

It is in the stage of development where I presume those influences to come in, which cause domesticated animals, when turned loose, to become feral. No variety can be stable unless the conditions of development concur to maintain the structureless stages of consecutive generations in an unchanged form. It is clearly of no avail to a breeder to obtain a stock by continued and careful selection, that shall conform to a desired type, if the animals be afterwards reared under other conditions, by which the subsequent stages, both latent and patent, shall be modified.

Lastly, it is in the process of selection of elements, both latent and patent, from the adult parents for the structureless stage of the next generation, where I suppose the curious and unknown conditions usually to occur, through which a change in the habits of life, after the adult age has been reached, is apt to produce sterility. I may be permitted to remark, hypothetically, that this view appears to be corroborated by the fact, that many grains of pollen or many spermatozoa are required to fertilise each ovum, because, as it would seem, each separate one does not contain a sufficiently complete representation of the primary elements to supply the needs of an individual life, and that it is only by the accumulation of several separate consignments (so to speak) of the representative elements, that the necessary variety is ensured. I argue from this that there is a tendency to a large individual variation in the constituents of each grain of pollen, or spermatozoön, and, by analogy, that there is a similar though smaller tendency in each ovum. Also, that changes in the habits of life may increase this variation to a degree that involves sterility.

One result of this investigation is to show very clearly that large variation in individuals from their parents is not incompatible with the strict doctrine of heredity, but is a consequence of it wherever the breed is impure. I am desirous of applying these considerations to the intellectual and moral gifts of the human race, which is more mongrelised than that of any other domesticated animal. It has been thought by some that the fact of children frequently showing marked individual variation in ability from that of their parents, is a proof that intellectual and moral gifts are not strictly transmitted by inheritance. My arguments lead to exactly the opposite result. I show that their great individual variation is a necessity under present conditions, and I maintain that results derived from large averages are all that can be required, and all we could expect to obtain, to prove that intellectual and moral gifts are as strictly matters of inheritance as any purely physical qualities.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, June 20.—Dr. Frankland, F.R.S., president, in the chair. The president announced that Mr. Hyde Hills had given ten guineas to the fund for promoting original research, and promised to further increase the donation by ten guineas for each ninety subscribed for the same purpose.—Mr. H. Deacon, on "Deacon's Method of Obtaining Chlorine, as Illustrating some Principles of Chemical Dynamics." The process consists in passing a heated mixture of air and hydrochloric acid over sulphate of copper, or over pieces of pumice or brick saturated with the same. He finds that the action is essentially a surface action, and that there is a certain comparatively small range of temperature, between the critical limits of which the percentage of hydrochloric acid decomposed varies greatly. The velocity with which the mixed gases pass over the surface of the active material also causes considerable variation in the comparative amount of chlorine produced.

BOOKS RECEIVED

ENGLISH.—As Regards Protoplasm, new edition: J. H. Stirling (Longmans).

AMERICAN.—The Periodic Law: Rev. G. A. Leakin.

FOREIGN.—Rendiconto dell'Accademia delle Scienze fisiche et matematiche, Naples, 1862-1869 (through Williams and Norgate).—Compendium der physiologischen Optik für Mediciner u Physiker: Dr. H. Kaiser.

PAMPHLETS RECEIVED

ENGLISH.—How Fishes Breathe: J. C. Galton.—Influence of Colloids on Inorganic matter: W. Ord.—The Edinburgh Sixpenny 4to. Atlas: W. and A. K. Johnston.—The Insulation of St. Michael's Mount: W. Pengelly.—The Sidereal and Solar Systems: C. C. Clarke.—The Influence of Human Progress on Medical Education: W. Aitken.—Influence of Vaccination, &c., on Mortality from Small-Pox: R. Grieve, M.D.—London Students' Gazette, May.—Annual Address to the Linnean Society: G. Bentham.—Transactions of the Norfolk and Norwich Naturalists' Society, 1872.—Meetings of the Newcastle-on-Tyne Chemical Society, 1871-2.—Journal of the Iron and Steel Institute, vol. i. No. 2.—Report of the Astronomer Royal to the Board of Visitors.—Quarterly Journal of the Meteorologieal Society, vol. i. No. 2.—Journal of Anatomy and Physiology, No. 10.—Proceedings of the Geologists' Association, vol, ii. No. 5.—Tenth Annual Report of the Birmingham Free Libraries Committee, 1871.—Report of Wigan Field Naturalists' Society, 1870-72.—Quarterly Weather Report of the Meteorological Office, Oct. to Dec., 1870.—Devon and Exeter Albert Memorial Museum School of Science and Art; Report for 1872.—Transactions of the Institute of Engineers in Scotland.—Report of Bury Natural History Society, 1872.—On Phonic Coast Fog-Signals: A. Beazeley.—Examination of the recent Attack upon the Atomic Theory: R. W. Atkinson.—The Mining Review, vol. i. No. 8.

AMERICAN AND COLONIAL.—The American Practitioner, May 1872.—Reports of the Mining Surveyors and Registrars, Victoria.—Report on the Operations of the Trigonometrical Survey of India, 1870-71: Major Montgomerie.—Second Annual Report on the injurious and beneficial Insects of Massachusetts: A. S. Packard.—Historical Sketch of the *Public Ledger* of Philadelphia: E. H. Munday.—Monthly Record of Observations in Meteorology and Terrestrial Magnetism: R. J. Ellery.—The Projected Science Association for the Natives of India, Mahendra la 'l Sircár, M.D.—Report of Progress of Commission of Foreign Forests, Victoria, 1871.—Report of the Entomological Society for Ontario for 1871.—The School Laboratory, vol. ii., No. 1.—The Sun and the Phenomena of the Atmosphere: Prof. C. A. Young.—Fourth Annual Report on the noxious and beneficial Insects of Missouri: C. V. Riley.

FOREIGN.—Atti della reale Accademia dei Lincei, 1871.—Forme delle Protuberanze regioni del magnesio e del ferro sulla superficie del Sole: P. Tacchini.—Memorie della Società degli spettroscopisti Italiana, No 4.—Bulletins de la Société d' Anthropologie, Aug. et Sept. 1871.—Indice degli autori e delle materie della gazetta chimica Italiana, vol. i.—Contribution à une histoire générale et Encyclopédique des Sciences: T. Wechinakof.—La Belgique hortico le, Mai et Juin.—Osservazione dell' Eclisse totale: Prof. L. Respighi.—Sull' ultima Eclisse del 12 Dec., 1871: L. Respighi.—The Quarterly German Magazine, No. 1, for 1872.

DIARY

THURSDAY, JUNE 27.

SOCIETY OF ANTIQUARIES, at 8.30.—Origin of the word Coach: A. Goldsmid.—On the Ruins of Torre Abbey. Miscellaneous Antiquities: Sir W. Tite.

FRIDAY, JUNE 28.

QUEKETT MICROSCOPICAL CLUB, at 8.

MONDAY, JULY 1.

ENTOMOLOGICAL SOCIETY, at 7.

TUESDAY, JULY 2.

SOCIETY OF BIBLICAL ARCHÆOLOGY, at 8.30.—On Israel in Egpyt: Dr. H. Haigh.—On the Mazzaroth of Job XXXVIII: Henry Fox Talbot, F.R.S.—On the Use of the Papyrus among the Accadians: Rev. A. H. Sayce.—On the Economic Botany of the Bible: James Collins.

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