

this decomposition, an observation which appears to destroy the usual theories regarding the function of those metallic oxides, which have a similar effect. It was supposed that the action of the catalytic bodies might arise from a power to absorb oxygen, but experiments made by placing black oxide of manganese under conditions similar to those in which it aids the decomposition of potassium chlorate, negated this supposition. Gas retort carbon can be completely burnt by contact with powdered potassium chlorate at 340°, the action is not attended by fusion, and it appears that in this case chemical affinity determines the decomposition. The action of heat upon potassium chlorate was studied by maintaining it at a constant temperature, and it has been observed that the chlorate begins to give off its oxygen between 330°—340°, *i.e.* at temperatures much below its fusing points. This decomposition goes on for several weeks and finally becomes imperceptibly small, but a rise of temperature or the addition of substances known to favour the decomposition, produce a fresh decomposition leading to a further limit. The authors propose a hypothesis to account for this gradual action of heat upon the chlorate.

SECTION C—GEOLOGY

On the Cause of Elevation and Subsidence of Land, by J. S. Gardner, F.G.S.—The paper claims that the evidence of the permanence of continents is inconclusive as regards eocene and pre-eocene periods, and inquires what the shallower regions of the Atlantic mean, if they do not mean a change of level at the sea-bottom. Assuming with Sir C. Lyell, that at a given depth rocks are molten, and that under further pressure they are reconverted into solids of high specific gravity, the paper demonstrates that the outer envelope is susceptible to and gives way under any increased weight, and recovers when this is removed. The evidence relied upon is that of coral isles, lava-flows, accumulations of ice, and of sediment in deltas, estuaries, and along sea-coasts. In these cases, unless there are counteracting agents, subsidence invariably follows, and littoral seas are thus areas of depression. The increasing pressure in deep oceanic basins acting on the fluid layer leads to the elevation of lines of least resistance into ridges or dry-land, these lines generally coinciding with coast-lines, and to volcanic outbursts. Geology demands pre-eocene communication between many lands. The elevation of land continuous between Europe and America in the north, during the Middle Eocene, was coincident with a cessation in the great formation of basalt, and its subsidence with a renewal of this. The conclusion is drawn that irregularities of surface have and will continue to become more and more accentuated.

Notes relating to the Drift Phenomena of Hampshire: (1) *Boulders, Hayling Island*; (2) *Chert Débris in the Gravel*; (3) *Elephant Bed, Freshwater Gate*, by Prof. J. Prestwich, M.A., F.R.S., refers to the remarkable boulders of crystalline and other old rocks in Pagham, which were noticed long ago by Mr. Dixon, and more recently Mr. Codrington has described similar boulders of Portsea Island, and states that boulders of the same character occur in the gravel of Portsea Island, two boulders of granite, and three of sandstone occurring on the shore near the station, while thirty smaller specimens occurred within a mile westward of the station. Those on the shore facing South Hayling have been collected to form a rockery and local grotto work. The author considers the boulders to have been brought from the Cornwall and Devon coast by floating ice, at the time of the formation of the Brighton raised beach.

On the Sources of the Salt Supply of India, by Prof. V. Ball, F.R.S., states irrigation in some of the central districts in India has produced sterility, by raising the permanent level of the sub-soil water in the ground, which becomes saline by contact with the lower strata, and through capillary attraction, salts of sodium potassium and magnesia were brought to the surface. The author states there are five distinct sources of salt in India, the most important of which are wells which have been sunk to a depth of 100 to 150 feet, and brine obtained, over a large area in the central region of India. In Assam and Burmah saline springs occur in connection with petroleum, 10,000 tons of salt are now being raised from the Sambur Lake. Rock salt occurs of Silurian age, and also in beds of Eocene Tertiary age.

On the Identification of certain Ancient Diamond Mines in India, by Prof. V. Ball, M.A., F.R.S., F.G.S.—The vague references to India as the only then known source of diamonds by the writers of 2000 years ago, give place to more definite indications of position in Sanscrit works of the sixth century,

and possibly of somewhat earlier dates. In the Barhat Sanita a list of localities is given, but as the stones from some of the localities therein mentioned were copper coloured, it is possible that they were not diamonds. In the *Ain-i-Akbari* (1590), and also less clearly in the *Ferishtah's History* (1425), a locality named Albeniguras is referred to, which can be identified with Wairugurh in the Central Provinces, where the remains of ancient mines are still to be seen. The following localities mentioned by Tavernier (1665), had not been identified until lately, though various attempts had been made by Colonel Rennell and others since his time. Gani or Coulour is Kollur on the Kistna; Raolconda is Ramulkota in Karnul; Soumelpour was on the Koel river in the Palamow district of Bengal. Kollur would appear from Tavernier's statement to have been the mine where the Great Mogul diamond was found. The same stone is mentioned by Garcias ab Horto, who wrote 100 years before Tavernier. Prof. Ball is of opinion that this stone, which was probably found in the middle of the sixteenth century, was the original of the Koh-i-nur. The author referred to several other early authorities, and to the mythical stories which are connected with the accounts of diamond mining, for the origin of which he proposed explanations.

On the Geology of Cardigan Town, by G. W. Keeping, M.A.—The author considers the Geological Survey in error as to the horizon, on which they place the Silurian rocks, underlying this town.

Notes on the Bure Valley Beds and Westleton Beds, by H. B. Woodward, F.G.S., considers the introduction of the term "Chillesford clay," and its supposed identification with any laminated clay that occurs on any horizon in the Norwich Crag, to have been the source of the confusion at present existing. The author finds there is no division between the Bure Valley beds and the Norwich Crag below, and that Messrs. Wood and Harmer are incorrect in referring that the former deposits are Lower Glacial.

The Iron and Lead Measures of Tynehead, Alston, by Mr. C. E. De Rance, F.G.S., of H.M.'s Geological Survey.—The Carboniferous Limestone of this area is split up into a series of limestone separated by thick beds of shale and sandstone, and traversed by an intrusive sheet of basalt, known as the Whin Sill; the section above that horizon consists only of about 200 feet of limestones, while sandstones reach 350 feet, and shales 520 feet. Beneath the Whin Sill there are 900 feet of measures, in which occur many important beds of limestone, one of which, the Melmerby Scar Limestone, reaches a thickness of 124 feet. The chief lead measures occur in the Great Limestone (70 feet), the Scar Limestone (30 feet), and the Tyne-bottom Limestone. The latter, deriving its name from its gradual inclination northward, forming the floor of the River Tyne; below this horizon but little has been done in proving the lead lodes in depth, owing to the water-charged condition of the rocks beneath. The veins in nearly every case are faults of small throw, when these traverse limestones, the veins contain lead; when they pass through sandstones they contain copper, and in both cases the sides consist of valuable deposits of brown hematite, which occasionally reach a thickness of 6 or 7 feet. These at present are not worked, but should a railway be carried up the Tees and into the South Tyne Valley, as is proposed to connect Alston with Middleton in Teesdale, these valuable deposits will be available for use in the Middlesboro district.

Notes on Alpine Post-Carboniferous (Dyassic) and Triassic Rocks, by the Rev. A. Irving.—This paper is merely supplementary to what has recently appeared in the *Geological Magazine*, on the Dyas and Trias of Europe. Attention is especially drawn to the three following points in connection with the Alpine Dyas ("Permian"):(1) the occurrence of the *Verrucano*, its possible equivalence with the Rothliegende, as advocated by Gümbel, in opposition to the view of von Hauer, who prefers to regard it as belonging to the lowest horizon of the Trias; (2) the great volcanic activity manifested in the Alpine area in post-Carboniferous times, as illustrated by the great porphyry district of Bozen (in connection with which the structure of the Ritterer Horn, a "stratified cone," with interbedded "ash" beds and porphyries, is described from recent observations by the author); (3) the occurrence of certain Alpine deposits (especially the Bellerophon Limestone of the Puster Thal, and the Grödner Sandstein at Neumarkt near Bozen), which, on palæontological grounds, are regarded by Gümbel as representing a "transition series from the Dyas to the Trias." Attention is also drawn to the correlation of the Triassic deposits on the northern and southern sides of the great

crystalline axis of the Alpine chain, and in particular to the apparent identity of horizon occupied by the massive Schlern dolomite, with its underlying St. Cassian Beds, and the Hallstatt Limestone with its underlying marls rich in St. Cassian fossils. This point is illustrated by sectional diagrams, one through the Steinernes Meer (after Mojsisovics), the other through the valley in which St. Cassian is situated. Numerous fossils recently brought from the St. Cassian district were exhibited.

On the Post-Miocene Deposits of Bovey Tracey, South Devon, by W. Pengelly, F.R.S.—Lignites with detrital gravel are of Lower Miocene or Upper Miocene age, and certain sub-tropical faunas, *Betula nana* beds of later date, of post-glacial age; the so-called "head" is of somewhat older age, and is referred by some to the glacial epoch. Described clay with angular smoothed stones, considered to be Boulder Clay by Prof. Heer and other foreign geologists but the author has failed to find any scratches upon the stones. 9 foot 6 inches below the surface is a bed of white clay with *Betula nana*. The author described the discovery of a canoe in the midst of clays, which he believes of older age than the era of *Betula nana*, and reports it to be probably of inter-glacial age if the head was of glacial age.

Problems on the Geology of the Channel Islands, by Rev. E. Hill, M.A., regards the work of the late Prof. Ansted as incomplete. The author considers that probably the Homoblenitic rock overlies the groups of Sark, but this requires working out. States that Prof. Ansted's conclusions as to the lithology of the rocks, are not founded on sufficient basis. He regards the work of Prof. Liveing as of considerable value in this direction, but he considers that there is much to be done in Guernsey, Sark, and Jersey. He describes basaltic dykes, dioretic dykes, and of mica-trap in Guernsey, the latter being in Sark.

The Southampton Artesian Well, by T. W. Shore and E. Westlake.—The question is, whether it is possible by an extension of the existing well, to utilise it as a source of supply to the town. The amount of water yielded by the well on the last occasion of pumping, in 1851, was 130,000 gallons per day. The quantity of water at present supplied to the town from the Itchen is from 3 to 3½ million gallons, but this is a much larger quantity per head than is found to be sufficient for towns under well regulated systems of supply. It thus appears that the well yields about 1-25th part of the quantity required. For the purpose of increasing the yield, two methods are suggested: one of them is to drive galleries or drift-ways in the chalk, the other is to continue the boring through the chalk into the Upper and Lower Greensands. The work of excavation was carried on from July, 1838 till 1851, at a total cost of 19,000*l.*, and reached a total depth of 1317 feet. The diameter of the well was 13 feet, diminishing to 7 feet; it passed through 464 feet of the Tertiary Beds, of which soil occupied 2 feet, Lower Bag-shot bed 74 feet, 304 feet of London clay, the latter consisting of sandy clay with seams of water-bearing sand and pebble beds towards the top; 84 feet of Plastic Clay, with the usual bed of greensand on the bottom. The chalk was reached at a depth of 464 feet, where the masonry was terminated, but the 7-foot shaft was carried 99 feet into the chalk; a 7½ inch boring was then made with a 7½-inch augur to a further depth of 754 feet, making a total of 853 feet of chalk. The whole of the chalk contained flints, with the exception of the last 10 feet. Most of the water met with appears to have come from the chalk; previous to the boring being made, in 1842, 20,000 gallons was raised. In 1844 the quantity rose to 50,000 gallons, and finally in September, 1851, to 130,000. The chalk thus supplies 5-6ths of the whole quantity. The authors then give a description of the Brighton chalk wells, and they consider the conditions are similar at Southampton. The authors, following the advice of Dr. Buckland at the previous meeting of the British Association, have ascertained the height of the Greensand springs:—

	Springs.	Height of Springs.	Height of Water in Well
Petersfield	{ Twyford	210	—
	{ Petersfield	300	150
	{ East Wordham	390	—
Kingsclere	{	—	137
Pewsey	{ Avon at	340	123
	{ Wivelsford	—	—
Warminster	{ Wilely at	—	—
	{ Boreham Bridge	337	112
Shaftesbury	{ Nadder at	200	87
	{ Barford	—	—

The authors are of opinion that large stores of water may be obtained by sinking into the Greensands.

On the Synclinal Structure of the Straits of Dover, by W. Topley, F.G.S.—Transverse valleys of the Weald, now dislocations or anticlinals, but, on the contrary, lie in synclinal flexures, this is observable in all the valleys of the Weald. The author considers there were six valleys on the north side of the Valley of the Weald, five of which still exist. The sixth intersected the Straits of Dover, its upper tributaries and the Rother, which now enters the Channel at Rye.

On Subsidence as the Effect of Accumulation, by Charles Ricketts, M.D., F.G.S.—There is no fact in physical geology more frequently recorded than that, whilst the deposition of sedimentary strata has been in progress, there has been simultaneously a subsidence of the earth's crust; though but little effort has been made to determine whether they are dependent on each other as cause and effect. Boring in deltas prove that depression to a great extent has occurred whilst the accumulation was being deposited. The greater amount of detritus derived from hills and valleys is carried into the sea, but, instead of filling it up, the water becomes of a great depth at a few miles from the mouths of large rivers. There was a progressive subsidence of the land during the glacial period; this may be ascribed to the weight of accumulated snow, and of the newly-formed boulder-clay; a similar depression is occurring in Greenland, under a rapid increase of snow. The carboniferous series above the limestone afford most satisfactory evidence that the amount of subsidence coincides with that of deposition; the surface of the limestone and the beds of coal furnishing sufficiently correct base-lines for determining the question. There must needs be a cause for this universal occurrence of subsidence with deposition of strata, the only efficient one being the weight of the accumulated material pressing down the crust of the earth resting upon a fluid substratum. Elevation also happens on the removal of pressure, and "those regions which have suffered the greatest amount of denudation have been elevated most."—(Capt. Dutton, U.S. Ordnance Survey). At the termination of the glacial period, the land, depressed by its load of snow, became, upon this melting away, re-elevated to a certain extent. This, and the rising of the land at the present time in Norway and Spitzbergen, may be attributed to the removal of a thick covering of snow. In elevated districts the highest parts are those in which there has been the greatest amount of denudation, and often consist of the lowest rocks in a geological series. The author thinks that these depressions and elevations cannot be ascribed to secular cooling of the mass of the earth, since by such action the accumulation cannot also be accounted for; nor could the same agency acting only in one direction cause both depression and upheaval. The concurrent phenomena of accumulation and subsidence, and their converse, demand serious and careful investigation; especially as in them may be found the great moving-power upon which depends the greater number of geological changes.

On the Origin of the Haematite Deposits in the Carboniferous Limestone, by Edward Wethered.—The author contended that the so called "pockets" of haematite which occur in the Carboniferous Limestone were caverns and fissures into which the ore had been introduced by water agency. There were two or three signs which indicated an approach to a pocket of ore:—1. Joints appeared in the rock, through which water percolated. 2. An ordinary cavern opened out, termed by the miners a Welsh "locus," the sides of which were coated with large crystals of carbonate of lime. 3. Traces of iron are found in the "locus." The fact that the first indications of ore were cracks in the rock, down which water percolated, certainly pointed to the inference that by a similar percolation the haematite has been brought into its present position. That it has been deposited by aqueous agency was clear from the crystalline character of some of the ore. Further, there was just what would be expected from water containing the carbonates of lime and iron in solution when not exposed to the atmosphere, namely lime has been first deposited, and subsequently hydrated peroxide of iron. The next point considered was, from whence was the iron derived. The highly ferruginous character of the Carboniferous strata was well understood, and the fire-clays indicated that large quantities of iron had been rendered soluble by the deoxidising influence of decaying vegetable matter, and removed by the percolation of water. But as to whether it was this iron which had given rise to the Carboniferous Limestone haematite deposits was a matter for consideration. It was doubtful whether there would have been sufficient time for the fissures and caverns to have so far developed as to form receptacles for the Coal-

measure water charged with carbonate of iron. It must, however, be remembered that after the uplifting of the Palæozoic rocks there was a vast lapse of time during the denudation by the Triassic Sea, and that much of the limestone, not now overlain by the Coal Measures and Millstone-grit, was covered by those beds for a considerable time. Further, water percolating through the Coal Measures would become highly charged with carbonic acid, given off from vegetation undergoing transition into coal, and water, so charged, would not be so long in dissolving and eroding out caverns. Mr. Etheridge had referred (*Quart. Journ. Geol. Society*, 1870, ix. 185) the origin of the Carboniferous hæmatites, in the West of England, to the infilling of faults, fissures, &c., during the denudation by the Triassic Sea; but stated that "doubtless the percolation of water through overlying strata, highly charged with oxides of iron, had been a source and mode of accumulation." Though the author was disposed to consider it possible that some of the hæmatite may have been derived from the percolation of water through the Coal Measures and Millstone-grit, yet he agreed with Mr. Etheridge that the most probable source was from the Trias rocks; not, however, during the accumulation of the strata composing that formation, but by subsequent percolation of water after consolidation of the beds. This water, on arriving at the Carboniferous Limestone, would flow down the cracks, fissures, and joints, provided there were such, but a comparatively small portion would filter through the actual rock on account of its being but slightly pervious to water. The author considered that it was owing to this fact that we generally find hæmatite where the Magnesian Conglomerate rests upon the Carboniferous Limestone. The water being unable to penetrate the rock, would naturally find an outlet at the junction of the two formations, and by the wearing away of the rock the conditions would soon be arrived at when the deposition of the iron would take place.

NOTES

THE concluding meeting of the French Association at La Rochelle was rather stormy, although not more than 203 members were present. M. Bouquet de la Grye was nominated vice-president for 1883 and president for 1884. Although very few members took part in the work of the meeting, sixteen different sections were kept in operation; this extreme division has somewhat impaired their activity. However a number of interesting papers were read and discussed. M. Debrun, Professor in the College of Pau, described a new system of central magazines for distributing electricity, a new balance for determining by mutual repulsion of currents their relative force, and a new registering electrometer. M. Marcel Deprez presented a new apparatus for determining the mechanical equivalent of heat, based mostly on Leon Foucault's experiments. He hopes to determine with a sulphurous acid calorimeter the real value of this coefficient with an approximation of $\frac{1}{10000}$ th. M. Tissandier presented again his researches on light bichromate elements; he contends that he obtains regularity of action without renewing the liquid, and without insulfation. Dr. Landowsky delivered an eloquent address against the dangers of injecting morphia, as practised nowadays by so many people. He deprecated strenuously this new method of intoxication; he calls it morphomania or morphinism. Dr. Audrat has paid special attention to the anæmia of miners, and described it in a very interesting address. Electric lighting experiments were tried in the rooms of the Hotel de Nantes by a new system invented by M. Debrun.

ADMIRAL MOUCHEZ has been visiting the Pic du Midi to ascertain whether astronomical observations could be conducted successfully there.

THE *Standard's* New York Correspondent telegraphs that Mr. Edison's system of providing an incandescent electric light for domestic use in a given district has just been put to a practical test in that city. The district selected occupies an area of nearly a square mile. Only one source of supply is provided, and that furnishes the illuminating power for sixteen thousand lamps, the electric current passing through eighteen miles of mains. The

result is that the severest demands which the consumers have been able to make upon the new system have been satisfied. The *New York Herald* is using in its business premises an isolated plant on the same principle. No new obstacle has presented itself to the success in practice of Mr. Edison's theory; and scientific men, the Correspondent states, will be interested to know that this first practical experiment demonstrates the soundness of the inventor's application of the multiple arc system, pure and simple, as distinguished from the series system, or the combination of the arc and series systems. Throughout the entire district lighted as described, each lamp was independent of all the others.

THE electric illumination of the Vaudeville, on the Boulevard Montmartre, is a great success. The hall is crowded every night. An 11 horse-power gas machine with Faure accumulators is sufficient to illuminate every night about 250 Swan lamps.

CONSIDERABLE interest was expressed by many visitors to the Ordnance Survey Office during the British Association meeting at Southampton, that the old and costly process of reducing the 25-inch maps to 6-inch scale, and engraving them on copper-plates, of which moulds had to be obtained, and electrotyped replicas had to be made, from which the copies were printed off, has been superseded by a cheap and rapid process, by which maps can be at once reduced and published on the 6-inch scale, so soon as the 25-inch scale is completed; by a simple application of photography the lines are reduced to any desired scale, and at once transferred to an inexpensive zinc-plate. The new 6-inch map, produced by the photozincographic process, adopted by the Survey in their reproduction of the Domesday Book, will in future be issued for all the counties of England and Wales, where no 6-inch maps exist engraved from copper plates, but in those counties where a portion of the area has been published, on the latter system, the old process will be continued to secure uniformity. The new 6-inch maps are smaller in size than those formerly published, and at present are not contoured, but their lines will be added in subsequent editions. Their publication will at once permit the much-required completion of the Geological Survey of our coal-fields, which is a matter of the most urgent necessity.

WE regret to learn of the death, at Dorpat, of Dr. Kreuzwald, the publisher of old Esthonian songs and poems. He was born in 1804, and studied medicine at Dorpat. When a student he began to collect songs and tales of his country-people, and in the years 1840 to 1850 he published a series of remarkable articles on Esthonian antiquities, mythology, traditions, and tales. His principal work was the publication, with annotations, of the whole of the different parts of the great Esthonian poem, "Kalewinöey," remarkable by its fine poetical feeling for nature and analysis of human feelings. It was translated into all the chief European languages. In 1877 Dr. Kreuzwald was compelled to abandon his medical practice, and died in poverty at Dorpat.

THE *Official Messenger* of St. Petersburg announces, on September 1, that "by order of the Emperor the admission of new pupils to the course of medical training for women, at the Nicholas Military Hospital, will be discontinued after the present term. The students will be allowed to conclude their course, after which the clinical instruction for women at the hospital will be abolished." The Medical Academy for Women, the courses of which were quite equal to those of the old Universities, had 367 students. Since 1877, when the first lady students passed the examinations, 281 ladies have completed the whole course of studies, and 152 had passed the examinations of M.D.; 105 of them were in service at universities and in public hospitals.

NEWS received from the Finnish Circumpolar observation party states that the members arrived at Sodankylä in the north