dynasty, about B.C. 1100. The nations discussed in the earlier volume were comparatively few, but when we turn to the later one we see that it treats of the history of all the peoples who lived in the countries which lie between Elam on the east, Cyprus on the west, Armenia on the north, and Berber on the south. How they arose, gained power, made war and invaded each other's territories, attained the zenith of their glory, were conquered, and were finally destroyed or merged in the ascending might of their neighbours, M. Maspero has undertaken to tell; and we think that he has carried out his task very fairly well. The overwhelming mass of notes and references to authorities testify to immense energy, and to a desire to put the reader in possession of a large number of facts. In the course of his work he has touched upon a variety of "burning questions," such as the Hyksos, the Hittites, the Exodus, &c., and we are tolerably certain that he will not please every one who reads his book; on many points we ourselves should disagree with him. To discuss these differences would require more space than we are allotted, and it is only fair to say that the general plan of the work is excellent, and that the author has spared no pains to make it a useful guide to the knowledge of Oriental history. On certain subjects his information is not obtained at first hand, but when we consider that he has to deal with Egyptians, Babylonians, Assyrians, Cosseans, Kassites, Elamites, Hittites, Arameans, Syrians, Hebrews, and others, this cannot be wondered at; and that he should be led away, at times, by his authorities is quite excusable. His chapters on Egyptian history are, as might be expected, worthy of his reputation.

The Camera and the Pen. By T. C. Hepworth, F.C.S. Pp. 64. (Bradford: Percy Lund, Humphries, and Co. Ltd., 1896.)

RELIEF blocks produced without the aid of the engraver are now extremely common—rarely do blocks of any other kind appear in NATURE—yet it is astonishing how very hazy are the ideas which the majority of people have as to the way they are made. In this slender volume will be found a sketch of the methods employed to produce line blocks and half-tone blocks, and we trust it will be widely read; for a knowledge of the possibilities of process work would often save the production of a bad block. The simplest form of process block is that made from line drawings, or pen-and-ink sketches. To obtain the best effect, the drawing should be made on Bristol board, or similar white surface, in very black ink. Liquid india ink is commonly used, but Stephens' ebony stain is sometimes preferred. This is photographed by the process worker, and, by a simple arrangement, a reversed negative is obtained. A sheet of zinc, covered with a substance which becomes insoluble after exposure to light, is placed in contact with this negative, and afterwards the unaltered parts are washed or rubbed off. The zinc plate thus marked is then etched, and eventually mounted on wood ready for the printing machine. It will be evident, then, that drawings to be used for the production of blocks in this way should be very distinct, and no lines or marks should be upon them but what are required to appear in the figure. The half-tone process is used for the reproduction of pictures other than line drawings. For illustrations of natural things and phenomena, where accuracy is all-important, reproduction by photographic process may be said to be essential. The only conditions for satisfactory results are clear pictures, which may be either negatives or positives.

Many hints of interest to photographers, as well as very instructive information on the processes of manufacturing blocks for illustration purposes, will be found in Mr. Hepworth's book. The only complaint which is likely to be raised about the contents is that they are deficient in details.

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LETTERS TO THE EDITOR.

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Bog Slides and Debacles.

THESE slides have been brought very prominently forward on account of the recent debacle near Gneevegullia, Co. Kerry. They are a subject that ought to be known and understood, as numerous observers and writers have brought the subject before the public since Gerrard Boate wrote on bogs in A.D. 1652, up to the present time.

If, however, we are to judge from what has been lately written, the public seem to be supposed to consider such a slide as that in Kerry as something quite out of the common, which no one can understand. But, on the contrary, bog slides and debacles are one of the numerous Irish disturbances, that lie dormant for a time and burst forth suddenly when least expected—take Gneevegullia Bog as an illustration. It is situated on the watershed of the Brown Flesk, a tributary of the Maine, the Blackwater and the Flesk, into all which rivers at times it sent squirts, but especially in late years, into the Quagmire River, a tributary of the Flesk. Into the latter river it sent a considerable squirt three or four years ago; now it breaks forth into the Flesk instead of the Brown Flesk; where it was always expected to go.

Small slides and debacles of both bogs and drifts, in the Irish hill groups, are not uncommon, and any frequenter of the hills must at some time or another have seen one. They give the observer a very nasty sensation. Suddenly he sees a curious shiver in a bog flat; at first he considers it to be only the shimmery air over the bog, so usual in hot weather, but presently he sees a "creeping where no life is seen," with a black steam or sheet issuing from it. Ten to one he immediately jumps up to make sure that his seat has not also taken to walking. Most bog slides are hard to see, as they usually take place during the night; there are, however, exceptions to this general rule, as the famous slide in the Ballykillim Bog, near Clara (1825), took place while the turf-cutters were at their dinner, and the slide on March 28, 1745, near Dunmore, Co. Galway, also took place in the day-time, and the turf-cutters had to run for their lives.

In the annals of the Four Masters there are records that must refer to either water-spouts or bog debacles, but they are too vague to quote. Gerrard Boate, in 1652, tells us how to drain a "shaking bog," but he does not record any movements. The first I know of is the communication to the Royal Society in 1697, by W. Molyneux, of the Bog of Kapanihan, Co. Limerick, near Charleville. As this began at 7 p.m. on June 7, 1697, the first movement of this bog could be described; afterwards he gives the final results, and the causes that made the movements. The newspaper reports at the time talk of the accompanying great noise; Molyneux, however, says there was none. The Bishop of Clogher also gives a good scientific account of a bog movement near Clogher on March 10, 1712; but the majority of the other records are by men who have gone in for sensation. This has been the case in the recent reports. No one knows when the movement began in the Gneevegullia Bog, but now we are told it was heralded in by noises and great shaking.

The printed records of big slides or debacles that I have read (as far as I can remember) are the following:—

- 1607. June 7. Kilpaniham, near Charleville, Co. Limerick.
 - 1708. Castlegarde, Co. Limerick.
 - 1712. March 10. Near Clogher. This bog had also moved, according to tradition, before 1640.
 - 1745. March 28. Addergot, near Dunmore, Co. Galway.
 - 1780. Monabogh, Dundrum, Co. Tipperary.
 - 1819. Valley of the Owenmore, Erris, Co. Mayo.
 - 1821. Slip in Joyce County, Co. Galway.
 - 1824. December 22. Ballyroindallow Bog, near Coleraine.
 - 1825 (?). Kilmalady Bog, near Clara, King's Co. Fasset Bog, 16 miles away, also moved, but did not burst forth.
 - 1867. Glen Castle Hills, Belmullet, Erris, Co. Mayo.
 - 1871 (?). In the Valley of the Suck, alongside one of the Roscommon tributaries.
 - 1871 (?). Clonagill, near Birr, King's Co.
- Other big slides will be found recorded by Lewis, but it would take time to go over all his County histories.

Every slide and debacle is due to the combined effects of great drought succeeded by heavy wet. In the majority of the bogs, of any extent, and even in some of very small dimensions, there are in parts "shaky bogs." Those portions in great drought dry and contract, thereby being traversed by fissures, and more or less broken away from their soles. When the rains descend and the floods come, the water first saturates and floats the lower portions and afterwards the upper portions. The latter process has a peculiar appearance. When a bog is saturated, on its highest part there is generally a Loughaun, *i.e.* a pool without any surface outlet. During a drought the bog about the Loughaun sinks, while it often becomes quite dry; but when the rains come, the bog swells just like a dry sponge put in water, and rises the Loughaun along with it. When a bog is saturated its lower portion is a sea of mud surrounded by a hard margin. If this margin in any place gives way there is a bursting forth ("debacle"), as in the recent case in Kerry, but sometimes the bog will over-swell, as in the case described by Molyneux, when the bog will begin "to walk" on its own account, and in its course lift up and carry away the barrier.

Different slides, such as that near Clara, that near Dunmore, and the recent one, were due to the turf-cutters, who weakened the barriers. Turf may be cut on two systems—"Brest banks," or banks opened round the margin of a bog or along a road; and banks that are more or less perpendicular to the margin of a bog or a bog road. The latter class of banks prevent slides, as they act as drains to the mass of the bog; while the Brest banks facilitate slides, as possibly may be exemplified this coming season, when the Brest banks are being cut.

Naturally it will be asked why all the bogs are not cut on the perpendicular system? The answer to which is, that it has been generally adopted in the mountain districts; but in the Low Land deep bogs this is nearly impracticable, as it would take years before you could run your bank into them, while all the time you would be at a dead loss. This, however, is a subject outside the present inquiry.

During my years of tramping the Irish hills, I have seen some interesting aspects of bog and drift slides; but it is unnecessary to recapitulate them here, as any one interested can fully read up the subject in previous publications.

It may, however, be allowable to point out that the different writers on the late Kerry debacle, apparently never saw the site of a previous debacle, or they would not make the foolish suggestions that have appeared in their writing.

I visited the Owenmore site about 1875, or about fifty years after its occurrence. This is the most disastrous slide on record, as it carried away a whole village and its inhabitants, also a picket of Highlanders, whose bodies were afterwards pinked up in Tullaghan Bay. When I saw it there was nothing very remarkable about the bog; it had a nice hollow in it, with a pollagh for snipe and duck; but if I had not been told to the contrary, I would have seen nothing very extraordinary about it. Of similarly other sites that I have visited, that in the Joyce country is now a heathy hollow, a good place for grouse; while that on the Glencastle Hill slope, when visited ten years after, could scarcely be detected, except that at the north end of the townland, adjoining the road and Broad Haven, there was a tumbling up in hummocks, partly drift, partly bog.

A new gulch, due to a debacle, is hard to cross, if not impassable, for a year or two; after which time the bog will have soaked, and the bog-mould slopes will begin to consolidate and grow vegetation; once they have a sod on them all appearances of the debacle rapidly disappear, so much so, that only one person out of a hundred, if you undertook to explain to him what had formed a gulch in a mountain slope, would believe you; the other ninety-nine would say "Hookey Walker!"

The bog, the site of the recent slide, is not more than 20 or 30 feet deep; this will contract at each side of the gulch so as to leave a hollow not more than from 10 to 15 feet deep, as has elsewhere been practically proved.

G. HENRY KINAHAN,
District Surveyor (Retired), H.M. Geol. Survey.

On the Goldbach-Euler Theorem concerning Primes.

I HAVE verified the new law for all the even numbers from 2 to 1000, but will not encumber the pages of NATURE with the details. The approximate formula hazarded for the number of resolutions of $2n$ into two primes, viz. $\frac{\mu^2}{n}$, where

μ is the number of mid-primes, does not always come near to the true value. I have reasons for thinking that when n is sufficiently great, $\frac{\mu^2}{2n}$ may possibly be an inferior limit. The generating function

$$\left[\sum_{i=1}^{\infty} \frac{1}{i-x^p} \right]^2$$

given in a recent number of NATURE, p. 196, is subject to a singular correction when the partible number $2n$ is the double of a prime. In this case, since the development to be squared is

$$\mu + x^n + x^{2n} + \dots + x^p + x^{2p} + \dots + \&c.,$$

the coefficient of x^{2n} will contain 2μ , arising from the combination of μ with $2n$, which is foreign to the question, and accordingly the result given by the generating function would be too great by 2μ .

This may be provided against by always rejecting the centre of the mid-range from the number of mid-primes. The formula will then in all cases give twice the number of ways of breaking up $2n$ into two unequal primes. Another method would be to take as the generating function not the square of the sum, but

the product of the fractions $\frac{1}{1-x^p}$ (without casting out n when

it is a prime), but this method would be inordinately more difficult to work with in computing series involving the roots of unity than the one chosen, which is in itself a felicitous invention.¹ Whether the method turns out successful or not, it at the very least gives an analytical expression for the number of ways of conjoining the mid-primes to make up $2n$ without trial, which in itself is a somewhat surprising result. Having lost my preliminary calculations, it may be some little time before I shall be able to say whether the method does or does not contain a proof of the new theorem; but that this can be ascertained, there is no manner of doubt. This is the first serious attempt to deal with Euler's theorem, or to bring the question into line with the general theory of partitions.

It is proper to regard the range 1 to $2n-1$ as consisting of two complementary flank regions, two lateral mid-prime regions, and a region reduced to a single term in the middle, as *ex.gr.*

$$1, 2, 3 : 4, 5 : 6 : 7, 8 : 9, 10, 11.$$

Or, again,

$$1, 2, 3 : 4, 5, 6 : 7 : 8, 9, 10 : 11, 12, 13.$$

And the question of $2n$ being resolvable into 2 primes breaks up into three, viz. whether $2n$ can be composed with two flank primes, two lateral mid-primes, or with the number in the central region repeated.

Some slight corrections are required in the preceding note in NATURE. P. 196, l. 5 of letter, for "improved method" read "original method"; l. 7, for "demonstration" read "denumeration"; l. 24, omit the words "with the exception of $2n=2$." Also, p. 197, l. 3, for " pe^p " read " pe^p ."

January 1.

J. J. SYLVESTER.

Patterns produced by Charged Conductors on Sensitive Plates.

IN the course of a recent X-ray lecture demonstration, I accidentally got what is, so far as I know, a novel, and certainly an interesting result. Having taken a radiograph of three small wire skeletons enclosed in cardboard bodies, on the developed plate (covered with a plain glass pressed upon the film) being put into the lantern, I noticed the precipitated silver particles set themselves in certain lines. These radiated normally from the skulls and limbs of the figures, and in the more open parts of the background set themselves into a key or fret pattern. I concluded, on further examination, that this effect was probably due to a state of electric strain induced by the Röntgen tube, but it was only upon the softening of the gelatine film by the heat of the lantern that the particles were set free, so as to obey the electric impulse to which they were subjected.

This led me to experiment upon the effect produced by charged conductors on sensitive plates, with the final result of

¹ For the generating function we may take any power greater than 2 instead of the square, and the coefficient of x^{2n} will then be the number of couples making up $2n$ multiplied by $(x^2 - x)^{\mu-1}$, which can be calculated by the same method as for the square, but is more difficult and must give rise to numerous theorems of great interest, arising from the multiform representation of the same quantity.