weights of each sort, according as n is even or odd; and that then any given weight can be expressed in a single way only if n is odd.

R. E. B.

I AM glad to have elicited a simple and direct rule for the required distribution, to obviate the necessity of a tedious tentative process, or of the reference to tables suggested in Mr. Willis's first letter. My own rule effected the desired object, but the device of admitting negative as well as positive remainders in the successive divisions by 3 is a decided improvement. R. E. B.'s method is identical with Mr. Willis's second method, and is undoubtedly the best. Its relation to my method is seen by noting that $\frac{1}{2}(2^7 - 1)$ is ternary 1111111, which, being added to 1101111, converts it into 2012000. My rule might have been generalized by adding (instead of the least value) any value of $\frac{1}{2}(2^n - 1)$ that exceeds the given weight.

In connection with Mr. Willis's suggestion (in his first letter) of tables for finding what number a person has thought of, I may mention that I published through Simpkin and Marshall, nearly forty years ago, a set of 4 cards for this purpose under the name of "Sibylline Leaves," of which a few specimens are still in my possession. Taking advantage of the fact that weights of 1, 3, 9, 27 will make up any integer from -40 to $+40$, that is 81 different integers when 0 is included, the numbers on the cards ran from 1 to 81. The computation consisted in taking 41 to start with, and adding or subtracting 1, 3, 9, or 27, two kinds of type being employed to distinguish between addition and subtraction.

J. D. EVERETT.

The Composition of Sea-Water.

COULD any reader of NATURE who may have given attention to the subject offer some explanation of the fact that the water of the sea contains such a very large excess of sodium salts relatively to salts of potassium?

Many of us have thought about the question, and heard it discussed, but I am not aware that any satisfactory conclusion has been arrived at.

I think it is usually assumed that the salts in the ocean have been mainly derived from the solutions carried in by rivers; solutions formed during the waste of rocks at the surface, or brought up by springs. Alkaline salts in such solutions will be principally due to the decay of felspars; and if we consider the rocks of the earth's crust, we find that the potash-felspars very much exceed in quantity the soda-felspars. It used to be considered that in earlier geological periods the "acid," mainly potash-bearing rocks, so enormously exceeded the "basic" rocks, in which the soda-felspars occur principally, that these latter were relatively quite insignificant in amount. Later petrographical work tends to show that this preponderance may not have been so large as was once supposed, but still there is no question that the excess of the potash-bearing rocks was, and is, very great. We might therefore look for more potash than soda in the drainage waters. We find, however, that in the sea, and in the rivers, the reverse is the case. Instances are, indeed, quoted (Roth, "Chemische Geologie") of rivers with more potash than soda in solution, but only as exceptions, and at points where only granite and gneiss had been drained.

This excess of soda in river-waters may be explained by the fact that though more potash-rocks are exposed than soda-rocks, yet the more rapid decay of the soda-lime felspars causes the proportions of the dissolved salts to be such as we find them; though this would hardly suffice to explain the great difference we find in the ocean.

Some people, again, assume that the composition of sea-water, though it may have been modified by the river-waters, is due to the constituents which were contained in the original first ocean as it condensed on the surface of the cooling earth—the "Urmeer" of the Germans; and Roth points out, in discussing analyses of river-waters and sea-water, that the composition of the former is such that they never could be the cause of the present composition of the latter.

This going back to the original ocean may be, as indeed it seems to be, the only explanation open to us, but it is not without its weak points. If potash-salts so greatly exceed soda-salts in the earth's crust now, we may assume that the same relative proportions existed, more or less, when the whole mass was still gaseous; and it is not easy to see any reason why, when cooling and condensation had allowed of the formation of a mass of molten silicates, the sodium-salts should have re-

mained in great excess in the still uncondensed heated atmosphere out of which the "Urmeer" would eventually be deposited on the cooling crust. Mere difference of volatility of the respective salts would not suffice to account for this; and if we are to take the hypothesis at all, we must perhaps assume that when a low enough temperature had been reached to allow of the combination of the respective elements to molten silicates, the potassium, as the stronger base, would be taken more largely into these combinations by preference to the sodium, which would partly remain in the still intensely heated atmosphere, to be condensed with other vapours at a later period. M.

Birds' Nests.

IN addition to your "curious places for birds' nests," I give you my own experience between 1842 and 1882 at Highfield House, Nottinghamshire.

Redbreast for four consecutive years on a shelf.

Redbreast in a fern (*Platycerium alcinome*) for four consecutive years.

Redbreast in a *Strelitzia regina* plant.

Hedge Warbler in a tall Fuchsia in a greenhouse.

Chiff Chaff in a fern (two years).

Pied Wagtail on a shelf in vinery (two years).

Flycatcher on hinge of door (ten consecutive years).

Flycatcher on ledge of thermometer stand (three years).

Wren in a Daniels's hygrometer stand.

County Club, Chepstow.

E. J. LOWE.

Butterflies Bathing.

IN answer to the inquiry of Mr. G. A. Freeman (NATURE, vol. xlii. p. 545) as to the food and habits of *Papilio macleayanus*, the butterfly which has been observed to visit water apparently for the purpose of performing its ablutions, I may inform him that the species is commonly found about Sydney, where it feeds in its larval condition on the camphor laurel (*Laurus camphora*), and the tender shoots and leaves of the orange. It certainly is not aquatic during any part of its life, nor do the plants upon which it feeds grow near water; the insect simply follows the example of its brothers, depositing its eggs singly, and undergoing the transformations on the food-plant as any reasonable butterfly should. Mr. G. Lyell's note as to the bathing habits of *P. macleayanus* is most interesting, and as far as I am aware the observation is entirely new, although many butterflies of the family Lycaenidae frequent pools on very hot days, settling on the mud at their margins, probably in search of a little moisture. Only recently at Toowoomba, in Queensland, I noticed a number of *Holochila absimilis* settled about puddles formed on the roads by a passing shower.

A. SIDNEY OLLIFF.

Department of Agriculture, Macquarie Street, Sydney,
November 11, 1890.

THE RESEARCHES OF DR. R. KÖNIG ON THE PHYSICAL BASIS OF MUSICAL SOUNDS.¹

I.

NOT often does it fall to the lot of a scientific man to become the mouthpiece of another whose researches have lasted over a quarter of a century; yet this is the enviable position in which I find myself on this occasion as the spokesman of Dr. Rudolph König, who is known not only as the constructor of the finest acoustical instruments in the world, but as an investigator of great originality and distinction, and author of numerous memoirs on acoustics. Dr. König, who has of late made very important contributions to our knowledge of the physical basis of music, using apparatus immeasurably superior to any hitherto employed in experimental investigations of this subject, has on various occasions, when I have visited him in Paris, shown me these instruments, and repeated to me the results of his researches. Important as these

¹ By Prof. Silvanus P. Thompson. (Communicated by the author, having been read to the Physical Society of London, May 16, 1890.)