children under your notice. Suffice it to say that in every instance I can and do constantly trace what others might term coincidences, but which to me appear nothing but cause and effect in their several developments.

"I will pass on to quote a few passages from letters written to me by two highly intelligent mothers, whom I asked to give me their experiences on this subject, if they had any.

"Mrs. B—— says: 'I can trace, nay, have traced (in secret amusement often), something in every child of mine. Before the birth of my eldest girl I took to ornithology, for work and amusement, and did a great deal in taxidermy too. At the age of three years I find this youngster taking such insects and little animals as she could find, and puzzling me with hard questions as to what was inside them. Later on she used to be seen with a small knife, working and dissecting cleverly and with much care and skill at their *insides*. One day she brought me the tiniest heart of the tiniest lizard you could imagine, so small that I had to examine it through a glass, though she saw it without any artificial aid. By some means she got a young wallaby and made an apron with a pocket inside which she used to call her "pouch." This study of natural history is still of interest to her, though she lacks time and opportunities. Still, she always does a little dissecting when she gets a chance.'

"I never noticed anything about P—— for some years. Three months before he was born a friend, whom I will call Smith, was badly hurt, and was brought to my house to be nursed. I turned out the nursery and he lay there for three months. I nursed him until I could do so no longer, and then took lodgings in town for my confinement. Now after all these years I have discovered how this surgical nursing has left its mark. This boy is in his element when he can be of use in cases of accident, &c. He said to me quite lately, 'How I wish you had made a surgeon of me.' Then all at once the light flashed in upon me, but, alas! it was too late to remedy the mistake.

"Before the birth of the third child I passed ten of the happiest months of my life. We had a nice house, one side of which was covered with cloth of gold roses and bougainvillea, a garden with plenty of flowers, and a vineyard. Here we led an idyllic life, and did nothing but fish, catch butterflies, and paint them. At least, my husband painted them after I had caught them and mixed his colours. At the end of this time L—— was born. This child excels in artistic talent of many kinds, nothing comes amiss to her, and she draws remarkably well. She is of a bright, gay disposition, finding much happiness in life, even though not always placed in the most fortunate surroundings. Before the birth of my next child, N——, a daughter, I had a bad time. My husband fell ill of fever, and I had to nurse him without help or assistance of any kind. We had also losses by floods. I don't know how I got through that year, but I had no time for reading. N—— is the most prudent, economical girl I know. She is a splendid housekeeper and a good cook, and will work till she drops, but has no taste for reading, but seems to gain knowledge by suction."

If the preceding cases are fully and accurately stated they seem to afford grounds for further investigation. Changes in mode of life and in intellectual occupation are so frequent among all classes, that materials must exist for determining whether such changes during the prenatal period have any influence on the character of the offspring. The present communication may perhaps induce ladies who have undergone such changes, and who have large families, to state whether they can trace any corresponding effect on the character of their children.

ALFRED R. WALLACE.

Habits of South African Animals.

THE following extracts from a letter just received from Mr. R. R. Mortimer, of Hanover Road, Cape Colony, contain some observations which will, I think, be of interest to naturalists, and therefore worth recording in the pages of NATURE.

ALFRED R. WALLACE.

"Since reading 'Darwinism,' powers of observation have unconsciously been gained by me. Day by day nature has some phenomena quite new to me, which phenomena would probably never have been observed by me if I had not had the good fortune to have digested the principles of the Darwinian Theory so obviously explained by you. From the time of reading the book till now I have observed peculiarities of organic beings in this part of the world. These observances I will relate: (1) The first observation I particularly remember was in regard to a peculiar action of a small bird, indefinitely termed by Colonials, snipe. What their specific or proper name is I cannot say, since the title of naturalist is not claimed by me. These snipe in question, or individuals of the variety, made their nests on mounds of dung which were practically the accumulated refuse of old sheep kraals. The shape of the nest was simply a hole scooped out on top of a mound. The colour of the refuse was a variegated dark brown and black. The eggs of such birds fully corresponded in colouration with the environment or surroundings. As a means of concealment, the colouration of the eggs was perfect. It required an extreme amount of careful inspection and search to detect the eggs in a nest on such mounds. When you came across the nest, you would find it was perfectly open and uncovered by any material; therefore you would presume the owners of the nest distinctly relied upon the colouration of their eggs to defy detection. But if by chance you detected a nest, and the owners *were* present, by holding yourself perfectly immovable and stationary, one bird would immediately approach its nest, and gradually cover it by scooping dust over the eggs with the action of its feet.

"This recourse to hiding its nest from view is only adopted on extreme occasions, when their sense-action gives them the knowledge that the enemy present has perceived its contents, or the nest itself.

"There must be a double selective agency in this mode of concealment at work.

"As far as my knowledge goes, our so defined snipe generally frequent localities where water is present. Now the *same* variety in question do make their habitat on banks of rivers, or where water is to be found; yet here have I noticed individuals of the same variety diverge from the specific character, take up a new area, if even only temporarily, where their eggs can be laid with more safety. It is an indisputable fact that the colouration of the snipe eggs is in union and harmony with the environment as a means of protection, yet here we find individuals of the same variety possessing the last possible resort of concealing its eggs—namely, covering them over with a material so as to defy any minute detective powers.

"Surely the struggle for existence must, in this case, be extremely severe, and the principle of natural selection in full activity.

"(2) Having had practical experience in farming with ostriches, and their domestication, I may say a few words on them.

"Ostriches have, so to say, no means of indirectly concealing their eggs; but the only means of concealing their nest is by their personal presence. The hen does her share of sitting in the daytime, her drab-coloured plumage being in harmony with the surroundings. The cock replaces her on the nest at evening time, sitting throughout the night, and generally on to 8 a.m., his black plumage corresponding with the shades of night; therefore you have some difficulty, sometimes very great, in detecting the nest of an ostrich.

"In addition to this remarkable adaptation of sexual colouration, the cock takes the *rôle* of a guard patrolling up and down some distance off the nest. When he perceives that mischief is bent upon the eggs by the approach of a person, he almost invariably charges him, and, woe betide if the person is destitute of some means of defence. To deliberately go up to a nest in the presence of its lord without some weapon or means of protection is considered by Colonials to be the height of foolishness and ignorance.

"But invariably again, on the other hand, when you have succeeded so far in reaching the nest, and handling its eggs, the cock quiets down.

"He loses all his viciousness, falls down alongside the nest, gives vent to, apparently, appeals for mercy, by continuously flapping his wings against the ground and giving forth sounds by means of his beak, of a peculiar dull clicking character.

"Domestication has made ostriches feel less fear for human beings, at the same time giving a more vigorous character to their viciousness.

"Some two years ago, among a troop of ostriches that were brought down to the farm where I was gaining my experience, there was one ostrich, a male bird in every respect in its external character and colouration of plumage. It was to *all* possible appearance a cock, and yet it had been seen on two occasions

to be paired by a true cock ostrich. This particular ostrich was a hen, although she had every appearance of being a cock. What explanation could you give as regards this incongruity?

"(3) About six months ago I found a peculiar bird's nest suspended from the root of a mimosa tree which overlapped a bank of ground. Before going further, I must first tell you that previous to the occasion in question I noticed the same peculiar form of nest, but it seemed so utterly impossible at the time that it could be a nest, since its structure and mode of suspension had the exact characteristics of a certain structural spider's web, that I passed it by. But on the second occasion, to make absolutely sure that I had not made a mistake, I went up and cut the nest off, with a certain length of the root to which it was attached. Imagine my surprise, when I saw that it was really a bird's nest with two eggs. Now this nest was a *perfect* facsimile of a common spider's web and home, found in the locality where I was at the time staying.

"Since it was a marvellous imitation of an insect's habitat, there must have been some corresponding necessity for such imitation. Either the nest must have been designed and constructed, so as to delude enemies by which the species was liable to be attacked, or, it was so imitated, that the materials of which the nest was made should serve as a bait, and allow the parent birds to be able to feed their young without the necessity of having to leave the nest, and so be unable to protect their young for the time being. The materials from which the nest was made were practically webs abandoned by their original owners. It was an instance of perfect imitation."

Astronomical Photography.

THE announcement (NATURE, August 10), that it is in contemplation to raise a sum exceeding £2000 for the establishment of a special photographic telescope at the Cambridge Observatory, leads me to ask whether astronomers have duly considered the facilities afforded by modern photography. At the time of my early experience of the art, thirty-five years ago, it would have been thought a great feat to photograph the Fraunhofer lines in the yellow or red regions of the spectrum, although even then the statement so commonly made that chemical activity was limited to the blue and ultra-blue rays was quite unwarranted. With the earlier photographic processes the distinction was necessary between telescopes to be used with the eye or for photography. In the former case the focal length had to be a minimum for the yellow rays, in the latter for the blue rays of the spectrum.

But the situation is entirely changed. There is now no difficulty in preparing plates sensitive to all parts of the spectrum, witness the beautiful photographs of Rowland and Higgs. I have myself used "orthochromatic" plates in experiments when it was desirable to work with the same rays as most influence the eye. The interference bands of sodium light may be photographed with the utmost facility on plates sensitised in a bath containing cyanin.

The question that I wish to ask is whether the time has not come to accommodate the photographic plates to the telescopes, rather than the telescopes to the plates. It is possible that plates already in the market may not exactly meet the requirements of the case, but I feel sure that a tithe of the sums lavished upon instruments would put us in possession of plates suitable for object glasses that have been designed for visual purposes. There would be no difficulty even in studying the requirements of a particular instrument, over or under corrected as the case might be.

A doubt may arise whether plates so adjusted would be as sensitive as those now in use. Probably Captain Abney, or some other authority, could give the required information. For some astronomical purposes a moderate loss of sensitiveness could hardly be of much consequence; for others doubtless it would be a serious matter. RAYLEIGH.

Terling Place, Witham, August 15.

The Discussion on Quaternions.

I HAVE followed with much interest the discussion on quaternions which has with more or less intermission been going on in NATURE for a long time.

It has always appeared to me that the student of physical science would better employ his time by studying the "Ausdehnungslehre" to which some of your correspondents have referred than by studying quaternions.

The wonderful work of Grassman is contained in a moderate-sized book in remarkable contrast to the two terrific volumes of Hamilton, which even Prof. Tait admits that he has not read entirely. The fact that the ausdehnungslehre could be mastered in a mere fraction of the time that would have to be devoted to the mastery of quaternions, is not however the important point.

The ausdehnungslehre seems to afford a symbolism more fitted for the expression of many recondite conceptions in physics, than anything which quaternions has to offer. Even the "Nabla" does not insinuate itself into Nature's secrets more cunningly than does the "Inneres Produkt."

Perhaps I may give an instance, which if elementary will at all events illustrate the extraordinary directness with which the different kinds of "product" reach the heart of a physical conception.

Think of a mechanical system of any kind which possesses but a single degree of freedom, think of any system of forces whatever applied to that system, and consider the question of equilibrium. The possible movements of the system form twists about one screw chain, the system of forces form a wrench upon another screw chain. Equilibrium will subsist if, and only if, the "Inneres Produkt" of the two screw chains is zero. Suppose any system whatever possessing n degrees of freedom. Dynamics teaches that mutually destructive twist velocities can be imparted to any $n + 1$ screw chains about which the system can twist. Does any conceivable symbolism assign those twist velocities more beautifully than the ausdehnungslehre? Each twist velocity is the "Kombinatorisches Produkt" of all the screw chains to which it does *not* correspond.

The aptitude of other conceptions of this grand calculus for physical problems could be as readily exemplified. But I forbear. Why has not some one ere this translated into English "Die Ausdehnungslehre von Hermann Grassman" 8vo, pp. 388, Berlin 1862? ROBERT S. BALL.

Observatory, Cambridge, August 18.

A Curious Optical Phenomenon.

DR. LAUDER BRUNTON has asked me to give you an account of a very curious phenomenon witnessed from the top of Gausta mountain (height 6000 Norwegian feet) in Telemarken, south of Norway.

We were a party of two ladies and three gentlemen on the summit of this mountain on August 4.

On the morning of that day the sky was passably clear; at noon there was a thick fog. Between six and seven o'clock in the afternoon (the wind being south to south-west) the fog suddenly cleared in places so that we could see the surrounding country in sunshine through the rifts. We mounted to the flagstaff in order to obtain a better view of the scenery, and there we at once observed in the fog, in an easterly direction, a double rainbow forming a complete circle and seeming to be 20 to 30 feet distant from us. In the middle of this we all appeared as black, erect, and nearly life-size silhouettes. The outlines of the silhouettes were so sharp that we could easily recognise the figures of each other, and every movement was reproduced. The head of each individual appeared to occupy the centre of the circle, and each of us seemed to be standing on the inner periphery of the rainbow. We estimated the inner radius of the circle to be 6 feet.

This phenomenon lasted several minutes, disappearing with the fogbank, to be reproduced in new fog three or four times, but each time more indistinctly.

The sunshine during the phenomenon seemed to us to be unusually bright.

Mr. Kielland-Torkildsen, president of the Telemarken Tourist Club, writes to me that the builder of the hut on the top of Gausta has twice seen spectacles of this kind, but in each case it was only the outline of the mountain that was reflected on the fog. He had never seen his own image, and he does not mention circular or other rainbows. A. WILLE.

Christiania, August 15.

Supposed Suicide of a Rattlesnake.

THE letter of Mr. E. S. Holden, of the Lick Observatory, in your issue for August 10, describing how a rattlesnake struck