Correspondence.

THE NUMBER OF OUR ANCESTORS.

To the Editor of the SCIENTIFIC AMERICAN:

My only excuse for asking you to give more space of your valuable paper to this question is that there still seems to exist a doubt as to the location of the fallacy in the proposition that x generations ago we each had 2^x ancestors; for, as Mr. Venning states, history probably justifies the conclusion that such a fallacy exists. As Mr. Eakin and Mr. Constable have shown, Mr. McCullough's contribution furnishes no solution to the problem. However, it contains a hint. Mr. Venning's calculation of the number of A's ancestors is based upon the assumption that the two members of every marriage among his progenitors have been totally unrelated. However, had some of these couples certain ancestors in common, a reduction in the number of A's ancestors would result. And looking from Mr. McCullough's point of view, which shows well the large number of descendants ordinarily following in several generations from one couple, we can easily imagine that the marriage of distant relatives occurs with unsuspected frequency.

Ithaca, N. Y. ROBERT KING.

HOW DOES A BIRD SOAR?

To the Editor of the SCIENTIFIC AMERICAN:

In regard to the question "How does a bird soar?" the writer has a theory which he has never seen in print.

Some writers claim that a soaring bird utilizes an ascending current of air which has been caused by some obstruction on the earth's surface in order to maintain a practically horizontal line of flight. The writer believes a bird creates (by the displacement of its body) a strong swell or upward pressure of air which does materially assist it in soaring flight.

Boatmen know that a swell is created off each side of a swift-moving boat. A certain distance back of this swell is a trough, and following a trough a breaker appears. A full, round bow will drive this swell nearly at right angles from the direction the boat is moving; a very sharp bow will send this swell away aft. These swells are all created by the displacement at the bow of the craft, and the direction of the swell will be governed by the shape of the bow and the speed of the boat. Water being a solid medium, a sudden displacement will cause a bulge in the water near the displacement, for it must follow the lines of least resistance, which in this case must be upward and outward.

A bird flying through the air must displace an area of air equal to its body. Air being an extremely elastic medium, an object like a bird's body (with a full breast and a hollow or concave surface in the body under the wing) passing through it will tend to compress the air and drive a large portion of it outwardly and upwardly practically at right angles to the line of flight. This compressed air will instantly expand largely in the direction in which it was driven by the displacement. The upward and outward expansion of this current will create practically the same swell in the air as the boat created on the surface of the water. Or there will be a high-pressure area under the wing seeking to expand in every direction. If the air above the wing is neutral and the air under the wing is compressed, say, two volumes in one, the expanding force upward will be ? pounds to the inch. If the concave surface of the wing fits the curvature of the swell, and the bird advances its wing well toward the front of this swell, the wing will have a pitch of at least 10 deg. downward with the horizon. With a slight contraction of the muscles (invisible to the eye) driving the wing backward against this air swell, the bird will be capable of keeping up a speed sufficient to cause the angle or line of expansion to follow lengthwise of the wing.

When muscular contraction can no longer keep up the necessary speed, the wing will drop backward to the top of the swell, or the swell will outrun the wing; the bird will then be compelled to flap his wings a few times; they will act as propellers to gain momentum or speed, until the wing can again take its place at the front of the swell or expanding air.

A careful examination of all heavy soaring birds shows them to be full-breasted (note the pelican for instance), while all our swift, flapping-wing birds, such as pigeons, have very sharp lines. The soaring birds with their full, blunt breasts drive large swells nearly at right angles to the line of flight, while the fine, narrow-breasted birds drive their swells far backward, leaving their wings to perform their action on undisturbed air.

There is yet another point to be taken into consideration; the rear edge of all birds' wings is very thin and flexible. The diameter of the compressed body of air will be possibly two-thirds the width of wing near the bird's body. It is believed that the sharp curve under the front edge of the wing is where the bird gets its muscular push on the air swell, tending to drive the swell backward. As the air cannot expand upward through the solid concave part of the wing, it is driven backward by the new forming swell toward the rear edge of the wing. Here the flexible tips of the feathers give way to the expanding air and turn upward. This tends to drive the wing forward through the spring of the feathers as the air escapes upward at the rear.

It is hoped that some of our aeronautical friends who have the necessary apparatus will experiment along the above lines and give the results of their findings to the ever anxious inventors as this may, in the end, result in a practical flying machine.

W. Palm Beach, Fla. C. N. NEWCOMB.

ELECTROCHEMICAL AMALGAMATION.

To the Editor of the SCIENTIFIC AMERICAN:

In recent years it has been discovered that there are large areas in southern California, Nevada, Arizona, New and Old Mexico, which contain vast deposits of low-grade sands containing gold values averaging from $1.50 to $7.50 per ton. Many of these deposits are of unknown depth. The values are microscopic, and there is no method at present known to the miner by which the values can be profitably extracted. There are also immense ledges and even mountains of low-grade ore, very refractory, which cannot now be profitably mined. The sea beaches from the Isthmus to the Arctic contain vast deposits of gold-bearing sands, but no practical method is known of recovering the gold, which is fine and flakey, and which cannot be saved by the usual gravity devices. In addition to these unworked gold fields, there are in California many miles of river beds containing debris and tailings from the placer mines; these tailings contain gold to the amount of $1 per ton, this amount being a low average, and the tonnage is beyond computation. The values are too elusive for extraction by any of the standard processes of gold saving.

In Alaska there are hundreds of miles of beach and river deposits containing vast sums of gold which is beyond the reach of the miner. In the sands of the Nome beaches the miners probably left $100,000,000 in gold because the riffles would not hold the fine beach gold, and they knew of no way to save the microscopic values which are associated with the particles of black sand.

There is enough gold in these various deposits to furnish ample coinage for all nations for a century; and it may interest the readers of the SCIENTIFIC AMERICAN to learn something of the attempts that are being made to break into Nature's secret store of wealth.

Scores of gold-saving machines working on the gravity principle have been constructed in a vain endeavor to solve the problem; amalgamating devices have been tried, but the impalpable values will not adhere to the amalgam surface; and when the particles of gold are larger, it is found often that the gold is coated or rusty or oily, so that mercury has no affinity for it.

About twenty years ago tests were made with a device using electrochemical principles (see page 205, vol. i, Proceedings London Inst. Min. and Met.) and the results were very encouraging. The science of electrochemistry has made wonderful strides in the last decade, and lately the problem of saving the impalpable values I have mentioned has been approached in a practical manner by various experimenters.

It has been found that the amalgamating action of mercury is greatly increased in the presence of electrochemical conditions, and devices have been constructed to utilize this fact in a commercial way. The bottom of a sluice box is covered with a copper sheet or plate; suitable electrodes (anodes) are arranged so that they may come in contact with the surface of the water flowing through the device; a solution containing a definite amount of mercuric bichloride is added to the water, and a low-voltage generator is connected with the anodes and the copper plate (cathode). The mercury from the solution is deposited in its nascent form on the copper plate, forming an amalgamating surface of the highest state of efficiency. The electric current passing through the water (electrolyte) cleans and brightens the gold, and all unfavorable conditions are destroyed. The microscopic gold particles are coated with mercury while in suspension, and the cataphoretic action of the electric current, aided by gravity, forces the values into an amalgamating contact with the mercurial surface. All values are deposited in the form of amalgam, which adheres tenaciously to the plate by the electroplating action of the electric current. We have an electrolytic amalgam which is smooth, firm, tenacious, yet elastic and viscid. The amalgam is not dislodged; and the mercury does not "flour." All the electrochemical processes assist in cleaning the gold, forcing it to the plate, and holding the resulting amalgam in place.

A current with a voltage too low to produce a shock is sufficient to give results that are marvelous; the device is so simple that its potency would never be suspected; its cost is trifling, and any electrician can make the installation. Yet the percentage of extraction is so high that ordinarily the tailings contain no values of importance.

Judging from numerous tests that I have witnessed, there seems to be no reason why electrochemical amalgamation should not prove to be the key which will unlock the vast hidden resources of Nature, and open mining fields and mining operations which will eclipse all efforts of the past. Electrochemical processes have also been used in connection with lixiviation and cyanide practice, and the time of treatment reduced from 24, 36, and 72 hours to 2 hours, while the extraction has been raised to 99 per cent.

San Jose, Cal. ELMER ELLSWORTH CAREY.

THE TERRESTRIAL ORIGIN OF THE MOON—A PROTEST.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of July 17th, 1909, you reprint a letter from Prof. Patterson of the University of North Carolina regarding the terrestrial origin of the moon, against which I am obliged to protest. Prof. Patterson's views are no doubt justified by opinions heretofore adopted, but are quite inadmissible in view of my recent discoveries regarding the origin of the planets and satellites. It is now proved (in A. N. 4308) that not one of our planets was ever detached from the sun by rotation, as very generally believed since the time of Laplace; and in the same way that the satellites could not have been detached from their several planets.

These conclusions were first drawn from the exact calculations based on Babinet's criterion, which is simply a formulation of the mechanical law of the conservation of areas that enables us to compute the rotation period of the sun or any planet when the globe in question is imagined expanded so as to fill the orbits of the bodies revolving about it.

But not content with showing that the planets and satellites could not have been detached by rotation, I afterward worked out a rigorous mathematical proof of the process by which the satellites had been captured. It was thus proved beyond doubt that the satellites of the solar system had originated by capture, and at one time moved in independent orbits around the sun. Jupiter's satellites are therefore nothing but captured planets. Though this investigation is one of extreme generality, I carefully avoided reaching any conclusion in the case of our terrestrial moon till the special circumstances of the lunar terrestrial system had been investigated. It was then found: (1) That the moon could have been captured by the earth quite as easily as any of the satellites of Jupiter and Saturn could have been captured by those planets. In fact, the probability that the moon was captured, like the other satellites, was shown to be literally *infinity to one*, by rigorous calculations based on the theory of probability.

(2) On the other hand, an independent investigation based on other phenomena showed the probability to be *infinity to one* that the earth could at no time in the past have had a rotation sufficiently rapid to detach the moon. The details of these mathematical investigations have been sent to the Astronomische Nachrichten for publication, and will appear very soon.

It is sufficient therefore to say that the moon never had a terrestrial origin, and all this terrestrial speculation is without foundation. In my papers I have carefully examined the celebrated researches of Sir George Darwin, and shown that he was misled by accidental coincidences. As the moon never was near the earth, but is really a planet which came to us from celestial space (see cablegram of May 24th in the Astron. Nachr. 4325), we shall have to give up all the old views about the former rapid rotation of the earth. In the same way the mathematical investigation recently published by Prof. Slichter of the University of Wisconsin in Publication 107 of the Carnegie Institution (pp. 61-67) on "The Rotation Period of a Heterogeneous Spheroid," is invalidated, so far as concerns application to our actual earth. All the bodies of the solar system have been captured, and not one of them formed by detachment from the central masses which now govern their motions. Besides the investigations above referred to, a further paper on this subject was presented to the Astronomical Society of the Pacific June 25th, 1909.

T. J. J. SEE.

U. S. Naval Observatory, Mare Island, Cal.

Luna Park, in the suburbs of Paris, is a new enterprise laid out after its Coney Island namesake at a cost of $500,000. The Temple of Mirth is packed with the usual queer contrivances such as human roulettes, zigzag steps and torpedo floors. The scenic railway, electrically run, has tunnels and caverns. "Shooting the Chutes" is another familiar attraction. One of the sensations is a realistic representation of the Johnstown flood which has remarkable electrical effects and which once used to thrill Coney Island. There is also the Infernal Wheel, and many other attractions.