of experimentation have been much improved, mainly by keeping up the spark of life, artificially, for a much longer time than was ever before accomplished.

A dog was prepared in such a way that a transfusion of blood from its carotid artery to one of the carotids of the head of the decapitated criminal could be promptly made, and thus a supply of living blood be made to flow through the lifeless head, and thereby preserve the excitability of the nervous apparatus. Into the other carotid (the right) of the head defibrinated blood at a suitable temperature could be injected. The head was received seven minutes after decapitation. The difficulty of finding the carotids in the soft tissues, which had become sadly disfigured by the decapitation, caused a loss of ten minutes. A small opening in the cranium was then made, so as to insert a pair of electrodes on the frontal parietal region of the left side, — the presumable motor centre for the facial muscles. At about twenty minutes after decapitation the double transfusion of blood was begun. The result was striking : a bright color returned to the face, which also assumed a natural expression. The effect was most marked on the left side, which received its blood-supply direct from the dog. The electrodes were inserted, but no result followed. Thinking this might be due to a stimulation of the wrong spot, they made another opening in the skull, and again stimulated the brain. This was followed by a regular and marked contraction of the muscles of the *opposite* side of the face, involving the orbicular and the superciliary muscles, together with a movement of the lower jaw, causing a strong chattering of the teeth. This effect could be repeated at will up to the 40th minute after decapitation, and, by increasing the current used in stimulation, to the 49th minute. After this no movement followed the application of the electrodes, although the facial muscles could be made to contract by direct stimulation of the muscles. The failure of the first stimulation was afterwards shown to be due to the unusual length of the head, thus causing an error of a few millimetres in the localization. At first the pupil could be made to dilate and contract by the approach or withdrawal of a strong light, — a fact frequently observed in previous cases. The peculiarities of the case are the great length of time for which the excitability remained, and the means employed for preserving this excitability, namely, the transfusion of living blood.

An opportunity of verifying these results presented itself in a subsequent case, but the results of cortical stimulation were negative. The explanation was offered, that the individual had furiously resisted the attempts of the officers to put his body in position for decapitation, and that the resultant neuro-muscular excitability prevented the orderly action of the electrical stimulation. However, a few new results were obtained. In the first place, the patellar or knee reflex, obtained by striking the tendon, was distinctly observed on the body. The contraction was perfectly normal. Another remarkable result was this : the cephalic end of the medulla was stimulated in hopes of exciting the nucleus of the hypoglossal nerve. The attempt was successful, and movements of the tongue such as follow direct stimulation of the nerve were distinctly observed.

Physiologists have not been very sanguine of results from this method of research ; but it seems that its importance has been rather underestimated. It will never be available for original investigations ; but it will serve as a means of verifying results otherwise obtained, and makes the inference from the facts with regard to animals to similar conditions in man more reliable.

PARASITISM AMONG MARINE ANIMALS.

IT is a curious fact that nearly all well-defended marine animals are either brilliantly colored or otherwise attractive, as in the case of the sea-anemone, jelly-fish, and tropical shells and crabs. Those with little or no defence are generally inconspicuous, or resemble surrounding objects. This may be explained by supposing that by being inconspicuous they easily escape the notice of their enemies. Brilliant, well-defended animals have little fear of enemies, and by their bright colors attract curious animals within reach of their deadly powers.

Many a fish in the sea instinctively avoids the deadly power hidden behind the brilliantly phosphorescent jelly-fishes. This protective light has saved the jelly-fish much trouble, and is a great aid to it in its struggle for existence among the multitudes of surface animals. Through some curious freak in evolution, an entirely inoffensive cluster of animals, devoid of any protective power, has gained the use of this phosphorescent light, and, by imitating the dangerous jelly-fishes in this respect, sails about the surface, inspiring terror among surface animals that could easily devour them. This cluster of animals is Pyrosoma. In the clusters of floating seaweed in the Gulf Stream there are vast numbers of tiny fishes attired in the color of the floating weed, and that certainly gain protection thereby.

The lump-fish has a sucker on its body by which it can attach itself to some fish of a similar

color, and go freely about, entirely free from danger. This is, no doubt, one way in which parasitism originated. At first an animal attached itself, for protection, to another having the same color; the next step was to burrow into the animal, and extract juices. There is a very curious fish that burrows in the side of another, leaving only a small opening out of which it can project its head and take food. Beyond this it does no harm to the fish. A curious case of parasitism is noticed in Penella, a copepod which burrows into the side of a sword-fish, and has upon its external stem a number of a peculiar species of barnacle, which in its turn has become parasitic.

The sting of the jelly-fish is deadly to nearly every animal of limited size; yet there is a small fish that habitually lives beneath the bell of the jelly-fish, in the midst of flying lasso-cells, without being injured. It manages to pick up a very good living from the crumbs left by the jelly-fish. What benefit it is to its host is hard to understand; but it is usually true, in such cases, that some service is returned. The habit of eating at the same table, or commensalism, is seen in many cases, that of the oyster-crab being a very good example. This crab lives within the oyster without offering harm, although it could easily destroy the oyster; but it is satisfied with what it gets, and leaves its friend alone. That such deadly powers as those possessed by jelly-fishes should have no effect, strange though it may seem, is hardly more wonderful than the power of resisting digestive fluids. In the stomach of a deep-sea sea-anemone a brightly-colored annelid is often found, in the digestive cavity. Whenever the anemone catches a fish, the annelid shares the meal without any injury to the anemone. Unlike intestinal worms, they are never numerous enough to be of any injury to their host.

This habit of one animal being dependent upon another for its existence receives a curious development in the case of deep-sea hermit-crabs and the sandy sea-anemones, of which Epizoanthus is an example. After the free-swimming stage, the anemone settles down upon the back of a shell inhabited by a hermit-crab, and begins to grow around the shell until it has entirely surrounded it, leaving only the entrance clear. The shell is eventually absorbed; and as the hermit grows, the anemone grows to accommodate him, so that he does not have to seek after a new shell. Thus the hermit is furnished with an accommodating, comfortable, and transportable house; but, in return, the hermit transports the sea-anemone from place to place, and keeps it upright. This is a curious case of division of labor among the lower animals.

There is a wide field for the study of the effects of hereditary instinct and evolutionary changes, as exhibited in the cases mentioned. Indeed, it would seem as if the best field for the evolutionist lay among the most degenerate types of an order, viz., parasites; for in their embryonic changes they pass through the higher stages of the past on their way to their present degeneration.

RALPH S. TARR.

A TRIP TO THE ALTAI MOUNTAINS.

WE left Semipalatinsk on Saturday, July 18, for a trip of about 1,000 versts, or 700 miles, into the wild mountainous region of the Altai. If you will draw a line on the map from the city of Tomsk, in a south by east direction, 600 miles or more, until it strikes the Chinese frontier, you will reach the region which I hoped to explore. The German travellers, Finsch and Brehm, went to the edge of it in 1876, but the high peaks lying farther to the eastward had never been seen by any foreigner, and had been visited by very few Russians. As far as the Cossack outpost known as the Altai Station, there was a post-road. Beyond that point I expected to go on horseback. The road runs from Semipalatinsk up the valley of the Irtish as far as the town of Oostkamenogorsk, and then turns away into the mountains, descending again to the Irtish at the station of Bookhtarma, and finally leaving it altogether at Bolshe-Narimskaya.

For 200 versts after leaving Semipalatinsk, the Irtish is bordered by a great rolling steppe of dry, yellowish grass. Here and there, where this steppe is irrigated by small streams running into the Irtish, it supports a rich vegetation; the little valleys being filled with wild roses, hollyhocks, golden rod, wild currant and gooseberry bushes, and splendid spikes, five or six feet high, of dark ultramarine flowers like larkspur; but generally the steppe is barren and sun-scorched. At Oost-Kamenogorsk and Oolbinsk I made the acquaintance of two very interesting colonies of political exiles, who received me with great friendliness and cordiality.

The farther we went up the Irtish, the hotter became the weather, and the more barren the steppe, until it was easy to imagine one's self in an Arabian or a North African desert. The thermometer ranged day after day from 90° to 103° F. in the shade; the atmosphere was suffocating; every leaf and every blade of grass, as far as the eye could reach, had been absolutely burned dead by the fierce sunshine; bleaching bones of perished horses lay here and there by the roadside; great whirling columns of sand, 100 to 150 feet in height, swept slowly and majestically across the sun-