Correspondence.

The Gila Monster and Its Prey.

To the Editor of the Scientific American:

I read in the issue of your paper for September 15 an interesting account of the Gila monster, by D. A. Willey, in which he says: "The breath is very fetid, and its odor can be detected at some little distance from the lizard. It is supposed that this is one way in which the monster catches the insects and small animals which form a part of the food supply—the foul gas overcoming them."

Now, although I do not know much about the Gila monster, it seems to me that a more plausible explanation of the use of this "foul gas" is that it attracts insects to the lizard, by its resemblance to the odor of putrid meat. Sydney A. Wright.

Bangor, Me., September 16, 1906.

Relation of Speed to Automobile Dangers.

To the Editor of the Scientific American:

Many, if not most, of the automobile accidents are due to the fact that the drivers do not know or do not realize the relation which speed bears to danger. The danger in all cases increases as the square of the speed. Take three machines of the same make, one going five miles an hour, one twenty miles an hour, and one forty miles an hour. The second has stored up in it, due to its rapidity of motion, sixteen times as much energy as the first, and if it leaves the road and runs into an obstacle, such as a tree, a stone wall, or a ditch, it will strike with sixteen times as great force. In going around a curve or turning a corner, it is sixteen times as likely to upset, skid into the ditch, or strip a tire; when the power is shut off and the brakes applied, it will go sixteen times as far before it can be brought to a stop; if it comes upon a pedestrian suddenly, the latter will have to exert sixteen times as much energy to get out of the way in time, and if struck will be struck with sixteen times the force. The third machine will be sixty-four times as likely to get into trouble in going around a curve as the first; if it strikes an object, it will do so with sixty-four times the force; when the brakes are applied, it will go sixty-four times as far before stopping; and if it comes suddenly upon anyone on foot or driving, the latter will have sixty-four times as much difficulty in getting out of the way in time.

An object going five miles an hour is moving with the same speed as it would have attained in falling ten inches; in moving ten miles an hour it is going as fast as though it had fallen three and a half feet. As the first is the average, and the second generally the extreme speed of horses and carriages, it follows that drivers of the latter seldom need to take speed into account in this connection. With automobiles it is different. Twenty miles an hour is generally considered a very conservative speed. Now, twenty miles an hour is the same speed that would be obtained were the machine to fall thirteen feet through the air; thirty miles an hour is equivalent to a fall of thirty feet; forty miles an hour to a fall of fifty-two feet; sixty miles an hour to a fall of one hundred and twenty feet; and one hundred and twenty miles an hour, the speed developed by one or two machines in the Florida contest last winter, to a fall of four hundred and eighty feet. A person struck by an automobile going twenty-five miles an hour receives the same jar as though he himself had fallen from a height of twenty-one feet, or say from a second-story window; by one going forty miles an hour, as though he had fallen fifty-two feet, or say from the top of a lofty tree; by one going a hundred and twenty miles an hour, as though he himself had fallen from the top of the Washington monument.

A consideration of these facts should help both legislators and automobile drivers in placing limits on speed. Charles S. Adams.

Are Sun Spots Caused by Tidal Action?

To the Editor of the Scientific American:

Many theories have been advanced as to the cause of sun spots. I suggest one here that I have never seen published before; that is, that the bodies revolving around the sun are directly responsible for the periodic roiling up of his surface. It has, indeed, been suggested that Jupiter and Saturn might produce the stress necessary, but they having been found inadequate in themselves, this tentative theory has been abandoned. I began to look for the nearest fixed star as the probable cause, but gave that up for the time being, as I now think that there are doubtless other large bodies in the solar system besides Jupiter and Saturn. To be brief, I think there is a companion sun. Against the theory that the sun spots are caused by forces from within the sun, I suggest the following:

No celestial body has an inward mechanism, like a clock, for instance, to produce periodically outward manifestations like spots on the sun.

All periodic changes that we see are produced by a disturbance from without, by some other body.

The most regular and periodic agency in the universe that we know of is an orbit, or a body moving in an orbit. Its regularity is absolute.

The spots on the sun appear at regular intervals.

The phenomena of the sun spots are tidal phenomena produced by bodies revolving around the sun in orbits.

A large body, about one-third the diameter of the sun, situated at the outskirts of the solar system, acting in conjunction with Jupiter and Saturn, which are comparatively near, would produce the required tidal action to make spots. The large outer body, or companion sun, has such a slow motion in its orbit, that for the question we are now discussing, it is practically still. Once in about eleven years Jupiter comes round on the same side of the solar system as this large body, which we will call Olympia, and both pull on the sun. Saturn can be either with these two, or directly opposite, like the sun and a full moon, making the same tide on the earth.

I am led to believe that there are perhaps three large bodies belonging to the solar system, outside the orbit of Neptune. The two next outside of Neptune are planets, and the third one out is a companion sun, some 200,000 or 300,000 miles in diameter, and distant some 33 hours in light waves. Though it may be self-luminous, it is probably only of the 18th magnitude.

On the earth the tide consists simply of a wave of water, which quickly subsides, but on the sun the tidal stress breaks open an envelope, liberates enormous quantities of gas or even molten material, and leaves a scar or spot that takes weeks to heal up. The thrown-out matter does not fall back again vertically, but distributes itself around, and the scar has to heal as best it can, with whatever matter it can collect.

The visible result of the tidal stress on the sun is somewhat different from that on the earth. Here we have the wave of water going around the globe. On the sun the tidal influence of Olympia is so evenly balanced with the strength of the sun's crust, or overcoming power, that no apparent tide is produced, but when Jupiter or Saturn comes in line, the balance is disturbed, the crust breaks, and an eruption takes place producing a spot. Imagine the Atlantic and Pacific oceans covered with ice to such a depth that no visible tide takes place twice daily as at present, but only twice a month, when the moon is new or full. On those two occasions the ice cracks, and the water spurts up into the air for hundreds of feet, and falling, makes a great frozen mound of ice. Two observers on Mars, let us imagine, see the phenomenon. One lays it to a powerful volcanic force, the other to tidal action. There may be no actual crust on the sun, but the hot gases, being held down by gravitation, are relieved and allowed to rise on account of the tidal stress at periodic intervals.

William D. McPherson.

South Framingham, Mass., September 15, 1906.

[Our correspondent's ingenious theory has been submitted to Prof. Henry Norris Russell, of Princeton University, who gives his views as follows:

"The theory outlined fails to stand the test of simple mathematical analysis.

"Such a body as the hypothetical Olympia may perfectly well exist. With a diameter one-third that of the sun, and a distance of 33 light-hours, or 240 times the earth's distance from the sun, it would be of about the twelfth magnitude, if shining by reflected light, and might easily remain undiscovered. But such a body would not produce sensible tides on the sun. The tide-raising force varies inversely as the *cube* of the distance. Olympia being by hypothesis of about 30 times Jupiter's mass, and 45 times its distance from the sun, would have a tide-raising force of $30/45^3$, or 1/3,000 as much as Jupiter, which is less than that of any one of the principal planets of the solar system except Neptune.

"It has often been suggested that the periodicity of sun spots is caused by planetary tidal action, but this is rendered improbable by the fact that they are *roughly*, not accurately, periodic, the successive maxima being different in intensity and unequally spaced.

"The correspondent is wrong in assuming that no celestial body has an inward mechanism . . . to produce manifestations like spots. Certain variable stars are almost certainly of this character. For a terrestrial example take the "Old Faithful" geyser in the Yellowstone, which is almost as regular as the sun spots, though the periodicity is certainly due to internal forces."]

The Current Supplement.

"The Tortosa Astronomical Observatory" is the title of the opening article of the current Supplement, No. 1606. Good illustrations accompany the text. Hector Macpherson writes on the construction of the Heavens. Prof. Sir James Dewar contributes a most instructive article on some new low-temperature phenomena which he has observed. The fourth installment of the article on Tinning is published. This installment deals with the tinning of copper and brass, blanching, stannic chloride, tinning of lead and zinc, extraction of tin from scrap tin, and tinning with tin amalgam. Some very old Greek jewelry which has been acquired by the Metropolitan Museum of Art is described and illustrated. Prof. Max Standfuss has for years been propagating butterflies and moths under artificial temperature conditions. He has taken the eggs of middle European moths, for example, and bred them at very low temperatures, and obtained varieties of that same middle European moth found only in Arctic regions. Similarly, eggs of the middle European moths, hatched at very high temperatures, produce varieties that are to be found only in tropical countries. Furthermore, by changing the temperatures he has obtained varieties which have existed but are now extinct, and varieties that will exist thousands of years hence. These experiments have a most important bearing on the old problem of the origin of species. Dr. Standfuss writes exhaustively of his experiments in the current Supplement. Prof. Crocker, of Columbia University, writes on some tests made with a new primary battery, which he considers a marked improvement in the making of batteries.

New Method of Photographing Colors.

Mons. Lippmann, to whom we owe all the progress made up to the present time in the difficult problem of the direct photography of colors, has just proposed a new solution. The principle of it is based upon the decomposition of white light by the prism. The colored object chosen as a model is placed before a glass plate bearing longitudinal striæ or flutings to the number of five to the millimeter. These flutings act like very small prisms which decompose the luminous sheaves proceeding from the image at their passage into the camera obscura. After the proof is obtained, developed and dried, it is placed in its position behind the fluted plate. If then it be illumined with the white light, it is seen through this plate to appear with the colors of the object photographed. The dispersive system of the fluted plate has decomposed the light into its elementary rays, and the colored radiations have been distributed upon the sensitive plate.—From L'Illustration.

THE WINNING FOREIGN MACHINES IN THE THIRD INTERNATIONAL RACE FOR THE VANDERBILT CUP.

The photographs which we reproduce on the following pages show seven of the eight foreign makes which ran in the third Vanderbilt cup race last Saturday, and one of the most novel American cars—the Christie. The other car of distinctively American design—the 110-horse-power air-cooled Frayer-Miller racer—we have already illustrated in the issue of September 29.

The Vanderbilt race last year was won by a four-cylinder Darracq light-weight racer of 80 horse-power. A car of similar type, but of 100 horse-power, was one of the representatives of France this year. Our illustration shows this machine mounted by its driver, Wagner, who recently won with it the 100-kilometer (62-mile) Ardennes race in France at an average speed of 72 miles an hour. This car differs from the other racers chiefly in two respects, viz., its short wheel base of but 96 inches, and its tangent, wire-spoked, suspension wheels. Much ingenuity has been used in fitting these wheels with detachable rims, so that the tires can be changed as readily and quickly as can those on any of the wood-wheeled racers, all of which are likewise provided with practically the same form of detachable rim, whereby, by removing eight or ten nuts, rim and tire can be quickly removed and replaced. The Darracq engine, as heretofore, is an extremely neat, clean-cut affair. The inlet and exhaust valves are placed in the cylinder heads, and are operated by light tappets on top. All the valve mechanism is worked from a single camshaft. The make-and-break igniters, and the low-tension magneto which supplies them, are on the opposite side of the engine to that shown. The peculiar plow-shaped radiator shown keeps the cooling water for the engine jackets below the boiling point without any fan to increase the draft. The water is circulated by a centrifugal pump. By pushing a button on the dash the driver can relieve the water-circulating system of any steam or air pockets that might form. The 1905 Darracq racer had no differential, and the transmission was suspended from the frame in the usual manner. The new racer, however, has the transmission combined with the differential on the rear axle—a most unusual place for it on a racing car. This transmission furnishes three speeds and reverse, as usual. The second speed is as high as 65 miles an hour. A propeller shaft with universal joints connects the leather-faced cone clutch in the motor flywheel with the transmission on the rear axle. The brake pedal operates a hinged band brake on the transmission shaft, while the emergency brake lever operates expanding-ring brakes in the rear wheels. The round tank behind the seats has a fuel capacity of 30 gallons, and supplies the carbureter by gravity. The water tank is built around the seats, and holds 6 gallons of water. The 3-gallon oil tank is placed on the floor directly in front of the driver's