eral writers now travelling in Europe; "Mrs. Harrison in the White House," — a paper telling of the daily life of the President's wife, — authorized by Mrs. Harrison, and written by one of the attachés of the White House; "Mary J. Holmes's Travels Abroad," in European capitals and countries. Articles by such writers as Mrs. Lew Wallace, Elizabeth B. Custer, Blanche Willis Howard, Julia Ward Howe, Harriet Prescott Spofford, Susan Coolidge, Dr. William A. Hammond, Anna Katharine Green, Mrs. Henry Ward Beecher, Grace Greenwood, Ella Wheeler Wilcox, Margaret J. Preston, Rev. Robert Collyer, D.D., and Kate Upson Clarke, will be features of each number. The new regular department by Rev. T. De Witt Talmage, D.D., we have already referred to. In this the famous preacher will talk on all subjects of interest to woman. The department will be called "Under my Study Lamp." Fifteen departments for woman's daily life will be sustained by the journal, including "Side-Talks with Girls," "Practical Housekeeping," "Artistic Needlework," "The Latest Fashions," "All about Flowers," "Facts for Mothers."

LETTERS TO THE EDITOR.

****Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Is Man Left-Legged?

IN view of the subjoined facts and remarks, we would seem justified in awaiting the presentation of more statistics and investigations, before giving an affirmative answer to the above query.

1. Of over fifty men questioned by the writer, every one answered that he would kick a foot-ball with his right foot, except two, one of whom was left-handed, the other ambidextrous; and out of forty boys interrogated by the school superintendent here, thirty-eight kicked with the right foot, and the two others equally well with either foot, both being ambidextrous.

2. About half of those asked took the spring, in leaping, from the right foot, and alighted on the left; the other half, the reverse. The strain and force required in either case seem about equal.

3. Every shoe-merchant of this place testified that nearly all their customers preferred trying a new boot or shoe on the right foot, considering that one the larger, especially in breadth.

4. Standing on either leg, and using it more, would rather tend to consolidate the bone, and develop the muscle, of that leg: hence the somewhat increased length of the left leg, indicated by Dr. Sibley, might denote comparative weakness. Besides, if the greater length of the leg is admitted as evidence of left-leggedness, by parity of reasoning, we should find the right arm, on right-handed people, longer than the left; which, from such evidence as the writer has been able to obtain, is not the case.

5. The recruit is taught, at the word "forward," to throw his weight on the right foot; and, at the word "march," to step off with the left. This position, in olden warfare, would be favorable for the use of the shield, the spear, and the cross-bow, and in modern times is equally appropriate for a bayonet charge or for firing, by right-handed men. In dancing, the instructions are invariably to begin the "chassez," and similar movements, with the right foot. Piano and harp pedals, besides various treadles for harvesters and other agricultural implements, etc., are usually made to accommodate the right foot.

6. That man is naturally right-handed, is stated to arise from a physiological cause (see Bell's "Bridgewater Treatise on the Hand," or McClintock's "Biblical Cyclopædia," when commenting on the ambidextrous Benjamites); and the same cause would be likely to strengthen the whole side, including leg and foot.

7. In the West, our race-courses, quite as often as otherwise, are so arranged as to make the horse and rider, or sulky driver, curve to the left. Circus-riders invariably follow the left-hand curve, in order to mount and dismount on the near side. The reason for generally mounting on the left is obvious. Every right-handed man, in going to battle, has his sword in scabbard on his left side, and seizes his bridle-rein with his left hand: hence the necessity of mounting from the near side, and placing the left foot in the stirrup, but all the weight comes on the right stirrup, when wielding the sabre, battle-axe, or lance; and the lunge with the foil or small-sword is made with the right foot, by right-handed men.

8. As in dancing the lady is on the right of her partner, naturally in "hands round" or "balance all," or in the first movement of the waltz, the turn is to the right; but in each case the circle pursued is a left-hand curve: so that the argument on that point seems to have little force.

9. Backwoodsmen state, that, when lost in the forest, they usually find they have wandered in a left-hand curve, and come back nearly to the place of starting; and experiments in wheeling a wheel-barrow when blindfolded usually result in the stronger right leg gaining on the left, thus producing an inclination to the left hand.

If the officers of athletic college-clubs at Harvard, Yale, Princeton, etc., would be kind enough to report to *Science* the percentage of those students who kick the foot-ball with the right foot, and the comparative measure between the right and left leg in circumference around the muscular portion, it would aid much in arriving at the truth, especially if the small percentage kicking with the left proved to be either left-handed or ambidextrous.

RICHARD OWEN, M.D.

New Harmony, Ind., Dec. 20.

On Physical Fields.

WHEN the physical state of a body re-acts upon the medium that surrounds it so as to produce in the medium a state of stress or motion, or both, the space within which such effects are produced is called the "field" of the body. When a body is made to assume two or more physical states simultaneously, each state produces its own field independent of the existence of the others: hence two or more fields may co-exist in the same space. For instance: if a magnet be electrified, both the magnetic and the electric fields occupy the same space, and each as if the other did not exist.

PROPERTY OF VARIOUS FIELDS.

I. The Electric Field. — Suppose a glass rod be electrified with silk or cat skin. It is experimentally known that other bodies in its neighborhood are physically affected by its mere presence without contact, and various motions result which are commonly attributed to electric attraction or repulsion. The phenomena are explained as due to the stress into which the neighboring ether is thrown by the electrified body, the stress re-acting upon other bodies, and moving them this way or that as the stress is greater here or there. Suppose an electrified mass of matter remote from any other matter, in free space. The field, or the stress that constitutes it, is found to vary in strength inversely as the square of the distance from the body in every direction about it, which shows that the effect upon the ether is uniform in all directions, and that for such a stress under such conditions the ether is isotropic. Experiment shows that this kind of a stress travels outwards with the velocity of 186,000 miles a second, or the same as that of light, which shows that the velocity of motion in the ether depends solely upon the properties of the ether, and not at all upon the source of the disturbance. If this assumed electrified mass of matter were the only matter in the universe, then its electric field would be as extensive as the universe, and any electric change in the mass would ultimately re-act upon the whole of space, and be uniform in every direction. If, however, there be another mass of matter in proximity to the first, the disposition of the stress is altogether different; for instead of being disposed radially, as in the first case, the field is distorted by the re-action of the stressed ether upon the second body. The so-called "lines of force" bend more or less towards the second body, and the field stress becomes denser between the bodies at the expense of the field more remote. If this advancing stress in the ether from an electrified body be called radiation, and it seems to be an action of that kind, then it appears that the direction of such radiation depends upon the existence of other bodies in the ether. It is truly rectilinear no further than the shortest distance between the two bodies.

The electric field thus produced, and thus re-acting upon another body, develops in the latter an electrical condition, that is to say, it electrifies it; and the process we call "electric induction," to distinguish it from the transferrence of the electrification by contact, which is called "conduction." In the process called induction there are two transformations: in conduction there is simply a transferrence, and no transformation. The experimental fact is this: an electrified body sets up in the ether a stress of such a nature, that, by its re-action upon another body, the latter is brought into a condition similar to that of the first; that is, it electrifies it.

II. The Magnetic Field.— A magnet in like manner sets up in the ether a stress that is propagated outwards with the velocity of light. The physical character of this stress is such that iron and some other substances upon which it can re-act are thereby rendered magnetic. Their molecules are re-arranged. On the supposition that a piece of iron were suddenly magnetized in any way remote from any magnetizable substance, the magnetic field would spread radially, having a spherical surface. As soon, however, as a piece of magnetizable substance was reached, the re-action of the ether upon it would begin; and the so-called magnetic lines of force will now be curves, and the equipotential surfaces will no longer be spherical. The distortion will depend upon the size, shape, and quality of the second body, as well as upon the strength of the field.

This process is called "magnetic induction." The magnetic field differs from the electric field in this important particular: the latter has no selective property, but re-acts upon all substances, while the magnetic field re-acts upon iron and a few other substances, and but slightly, if at all, upon most bodies. They are alike, however, in this: their equipotential surfaces are determined by the presence or absence of other bodies.

A magnet then sets up such a physical condition in the ether, that its re-action upon another body brings the latter into a condition similar to that of the first; that is, it magnetizes it.

III.— The Thermal Field.— An isolated hot body becomes cool by a process called radiation. It is explained by saying that the atomic and molecular vibratory motions that constitute the heat of the body, set up undulatory motions in the ether. These undulations are propagated with the velocity of light, certain wave-lengths being light. The path of a ray is straight, and is continued indefinitely outwards, to the boundary of the universe if there be a boundary; if not, then to an infinite distance. A hot body has a field, as well as an electrified or a magnetized body.

Experimentally we know that when these undulatory motions called rays fall upon other matter, it becomes heated in consequence; and we also know that the energy acquired by the second body from the radiations depends rigorously upon the area exposed to them. It is customary to say that the intensity of light varies inversely as the square of the distance from the source, when intensity means energy. This is true, however, only for equal intervals of time; for if a body at unit distance was exposed to radiations from a constant source for one second, and another similar body at double the distance was exposed for four seconds, each unit of surface would have received the same amount of light or radiant energy.

The presence or absence of another body in the thermal field makes no difference in the strength of the field in other directions: in other words, the absorption of radiant energy of this sort makes no manner of difference in the direction of other rays that have not been stopped. I am not aware of the existence of any evidence that a ray of radiant energy of any wave-length is ever deflected from its rectilinear course except by a change in the density of the medium through which it passes, and not then if the incidence be normal. In this respect the thermal field is entirely unlike the other two fields. In addition to this, let it be remembered that a hot body continues to impart its energy to the ether until its income equals its expenditure, according to Prevost's law of exchanges: so, if there were but a single hot body in the universe, it would impart its energy to the ether, and approach infinitely near absolute zero; while an electrified body or a magnet would be perfectly insulated, and, so far as is known, would lose none of its properties, however long it was thus kept. There is no static condition in heat phenomena: exchange is constant. These facts indicate that light or radiant energy is no more an electro-magnetic phenomenon than magnetism is a thermal phenomenon, but that it is one of a distinct order.

That point is inmaterial here, for what I wish to call attention to is the fact that a heated body sets up in the ether such a physical condition that its re-action upon another body brings the latter to a condition similar to the first; that is, it heats it.

IV. The Acoustic Field.— There is another physical field with which all are acquainted, though it has not hitherto been called by that name. I refer to the phenomena of sound. Suppose a bell be struck: sound-waves in air are formed, that travel outwards, and have the same geometrical space relations that other fields have. So long as the medium is uniform, the field is uniform, and the energy of the sound-waves per unit surface and unit time varies inversely as the square of the distance from the source. When such sound-waves fall upon other masses of matter, they are absorbed and reflected. Those that are absorbed set the body in vibratory motion similar to the original vibrating body; that is to say, they produce sound. If such second body upon which the waves fall happens to have its own vibratory rate in accordance with the time-rate of the incident waves, the effect is cumulative, and the body may be made to visibly as well as audibly vibrate. If not, the vibrations are said to be forced vibrations; but in every case every body in an acoustic field is made to vibrate. Now, there is the same distinction between the vibratory motions of the bell and the air-waves that result from them as there is between heated molecules and the undulations in the ether; but acoustical terminology has not hitherto been so seriously incommoded hy the failure to make the distinction as has been the case with heat phenomena. As sound phenomena are treated as special cases in kinetics, the space within which sound-waves are produced by the vibratory motions of a body may be spoken of as the acoustic field; and here, as in the other three cases, we have the fact that a sounding body sets up in the medium about it such a physical condition as, by its re-action upon another body, brings the latter into a vibratory state like the first.

These various physical relations may be thus generalized: when a mass of matter acts upon the medium that is about it, the latter is thrown into such a physical condititION or state that its re-action upon another body always induces in the second body a state similar to that of the first body. This has a much wider application than most physical laws; for it embraces phenomena in mechanics, heat, light, electricity, and magnetism. A. E. DOLBEAR.

Tufts College, Dec. 21.

The Waters of the Great Salt Lake.

LONG before white men first trod the shores of the Great Salt Lake, strange stories of this inland sea had found their way into the civilized regions of our own land, and even beyond the ocean. The earliest record of the lake was made in 1689 by the traveller, Le Hontan, who relied for his information upon the wild tales told by the Indian tribes of the Mississippi valley. In 1843, however, the lake was visited, its shores explored, and its waters navigated, by Gen. Frémont, of extensive fame. Six years later (1849–50) a fuller survey was made under the personal direction of Capt. Howard Stansbury, U.S.A., whose report, "Expedition to the Valley of the Great Salt Lake," issued at Washington in 1853.

The Great Salt Lake is by far the largest body of water existing in the "Great Basin." Its average length is seventy-five miles; and its width, forty miles. The altitude of the lake is near forty-two hundred feet above sea-level, and the region is declared by geologists to be still rising.

Even a hasty examination of the Salt Lake valley will convince the observer that the present lake is but the shrunken remnant of a vastly larger body of water, which at one time stretched far beyond the limits of the valley. This former sea was a feature of quaternary times, and has been named Lake Bonneville. It extended beyond the Idaho line on the north, invaded Nevada on the west, and closely approached the Arizona boundary on the south. Of this great body, Utah Lake and Sevier Lake, now existing as distinct occurrences in the regions south, were but comparatively small bays. Numerous water-lines are visible along the mountains adjacent to the Salt Lake, the highest of which is about one thousand feet above the present water surface; and the evidence of wave-action along this ancient shore is abundant.

The history of Lake Bonneville, as recorded on the stony pages of its precipitous shores, and in the hardened sediments of its floor, is more complicated than a mere recital of the shrinking and falling of waters through evaporation and other wasting causes. For most of our knowledge upon this subject, we are indebted to the detailed observation and study conducted by the United States Government Survey corps, and especially to the investigations carried on under the direction of Major J. W. Powell. Referring to the labors of Mr. C. K. Gilbert and his associates in the lake region, Director Powell thus briefly summarizes the history of Lake Bonneville:—

"First, the waters were low, occupying, as Great Salt Lake now does, only a limited portion of the bottom of the basin. Then they gradually rose and spread, forming an inland sea, nearly equal to Lake Huron in extent,,with a maximum depth of one thousand feet. Then the waters fell, and the lake not merely dwindled in size, but absolutely disappeared, leaving a plain even more desolate than the Great Salt Lake Desert of to-day. Then they again rose, surpassing even their former height, and eventually overflowing the basin at its northern edge, sending a tributary stream to the Columbia River; and, last, there was a second recession, and the waters shrunk away, until now only Great Salt Lake and two smaller lakes remain."

As is clearly understood, the oscillations of the water in a lake possessing no outlet will be far more marked than in an opposite case. In a body of water with an outflow, a tolerably uniform level will be maintained, the irregularities in the supply being compensated for the most part by the varying volume of water flowing away; but the level of a lake completely enclosed will be due to the relation existing between the supply of water and the rate of evaporation. The topography of the ancient shore-line of the Great Salt Lake shows, that since the time of the "second recession" of the waters, referred to by Major Powell in the quotation made above, the lake has been unable to find an outlet for its contents, and has consequently reached its present diminutive proportions through loss by evaporation alone. The composition of the water would necessarily vary with the concentration. The analysis most commonly accepted, and which forms, indeed, the basis for current quotations and references, is that made by Dr. Gale, and published in Stansbury's report. Gale found the water to possess a specific gravity of 1.170, and to contain 22.282 per cent by weight of solid matter, as follows: sodium chloride ($NaCl$), 20.196 per cent; sodium sulphate (Na_2SO_4), 1.834; magnesium chloride ($MgCl_2$), 0.252; calcium chloride ($CaCl_2$), a trace.

These figures are used as indicative of the present composition in several of the most recent cyclopædias, such as are used for general reference; and even the revised school text-books in geography quote as above. It should be remembered in accepting such results, however, that the investigation upon which they are based was made on water collected forty years ago; and it is scarcely to be expected that such would represent the composition of the water at the present time. For a number of years preceding 1883 the lake had been steadily rising. This rise was entirely independent of the annual oscillations to which the waters of the lake seem subject under all circumstances. In referring to this fact, Mr. Gilbert writes as follows (see "Lands of the Arid Regions," p. 66):—

"Thus it appears that in recent times the lake has overstepped a bound to which it had long been subject. Previous to the year 1865, and for a period of indefinite duration, it rose and fell with the limited oscillation and with the annual tide, but was never carried beyond a certain limiting line. In that year, or the one following, it passed the line, and it has not yet returned. The annual tide and the limited oscillations are continued as before, but the lowest stage of the new *régime* is higher than the highest stage of the old. The mean stage of the new *régime* is seven or eight feet higher than the mean stage of the old. The mean area of the water surface is a sixth part greater under the new *régime* than under the old. The last statement is based on the United States surveys of Capt. Stansbury and Mr. King. The former gathered