go from Central Utah, at an elevation of 4,500 feet, north and eastward to the high mesas of the Yampa and White Rivers, at an elevation of 8,000 to 10,000 feet, where several feet of snow cover the ground for two or three months. In that region during the great snow-storms the wind usually blows from the south or south-west. Some precipitation occurs on a north wind, but it is preceded by west or south-west winds. It thus becomes evident that the precipitation on the western slope of the mountains is chiefly derived from the Pacific. Where does the moisture come from that falls on the eastern slope?

The larger part of the precipitation on the eastern slope of the mountains takes place while the surface wind is blowing from the north or some quarter from the eastward: hence it has often been stated that this is Atlantic moisture. Doubtless much of it comes to us from the Gulf of Mexico by way of the Great Plains, yet in most cases it is easy to prove there has been a large supply from the Pacific.

First as to the storms of the colder months from October to May. These storms usually cover large areas. The precipitation is from stratus or cumulo-stratus clouds moving over the mountains. Several days of south-west wind in most cases precede the shifting of the wind into the north or some eastward quarter, at which time the precipitation takes place. During some of these storms the wind blows from some westward quarter for several days, so that it is often certain that sufficient wind has passed eastward to permit air direct from the Pacific Ocean to reach eastern Colorado and the Great Plains. As the storm-centre advances, this same air must often be deflected backward toward the mountains. It is obvious that in the case of cyclonic storms there is an influx of air from the west (the "Chinook" winds) in the region south of the storm-centre. In the larger storms the distance travelled by the wind is so great as to permit air direct from the ocean to cross the mountains.

Occasionally storms break upon us without the premonitory south-west winds. Thus a blizzard struck south-eastern Colorado Oct. 30, 1889. The winds had been light and variable. Suddenly the wind shifted into the north to north east, and for several days raged at a high velocity. There was a heavy precipitation of snow, and not even the rotary snow-ploughs could keep the railroads open for travel. Several thousand miles of wind from the direction of the plains and Missouri valley were driven obliquely up the slopes of the mountains. The signal maps show that the storm-centre passed north-eastward over northern Texas, and the area of west winds was far south of here. Over Mexico and Texas there must have been a large movement of Pacific air eastward.

Second, the summer thunder-storms. These also are preceded by west to south-west winds. In general, the longer the west winds continue, the more violent will be the storms when the final break-up comes. A common type of development of the July storms is the following. Warm winds begin to blow from the south-west, and continue four or five days. The temperature becomes progressively hotter. Some day we see a cumulus-cloud over the mountains begin to throw out filmy streamers above and a fringe beneath. It rains a little above timber-line, and there may be a discharge of cloud-lightning. Then, as the cloud passes eastward over the plains, it loses its ominous fringe, and becomes an ordinary sleepy cumulus with a sharply defined edge. Next day the attempt at a storm is repeated, the fringe is longer and the cloud is larger, but the ranchman who is wishing for rain looks on in disgust at the abortive effort, and remarks that there is a lack of ginger in the upper air. Meantime the general movement of the lower mile or two of the air continues from the south-west. After a few more days of failure, we some day see high cirrus streamers and films begin to form before noon. Soon after, there are big cigar-shaped masses of cirro-stratus far below the cirrus. Still farther below are innocent-looking cumulus-clouds with rather definite margins. As the afternoon advances, one of these begins to bristle with an indefinite fringe above and below. The fringes grow longer. Presently a marginal belt of rounded festoons appears outside the central fringes and beneath the storm-cloud, while above it the high streamers radiate outward in the sheaf-of-wheat pattern. In the mean time a halo, or part of one, has appeared around the sun in the higher filmy clouds. Before midnight there will be hail and cloud-bursts on the mountains, and these storms will go hundreds of miles eastward onto the plains. It often happens that the first storms go northward or north-eastward. The next day they shift toward the west. In a few days they will come from the north-west or north. Then the air will be cool, the general movement of the air is from the north, and there will be no more storms until after another season of south-west winds.

Thus the summer showers, as well as the winter storms, derive most of their moisture from the Pacific. There are different types of these local electrical storms, but they all are alike in one respect: they appear as local disturbances in the midst of an area of relatively heated south-west or west winds.

The present summer has been remarkable for the amount of Pacific air. Heretofore, during several years of observation, the wind has never been known to blow briskly from the south-west for more than one to three weeks without the formation of some kind of storm, or at least attempted precipitation, which interrupted the west wind.

This year, during late May, June, and July, there were more than two months of almost constant wind from the south-west over the mountains. It should be noted that the wind in the valleys, near the base of the mountains, is often variable, and there are local movements this way and that, while all the time the clouds on the mountains show that the wind is there from the south-west. Several thousand miles of air fresh from the heated regions of Southern California, Utah and Arizona, have passed eastward over the mountains. Hot weather prevailed simultaneously over eastern Colorado, Kansas, Missouri, and eastward. Such a movement I have not noticed before in eight years of observation. The thunder-storms have this year been late in forming in Colorado, notwithstanding the great supply of Pacific air. For nearly two months the clouds seemed to be at a rather low level in the air, and there was much less of the high cirrus than usual. No solar halos appeared till about the middle of August. Their appearance was followed by very violent hail-storms and wash-outs. In short, we appear for once to have had for most of the summer too much Pacific below, and too little Arctic up above.

It is noticeable that the tornado belt this summer lies far to the north and east. Is not this the result of the vast body of Pacific air which has invaded the Mississippi valley? It appears as if for some cause the meeting-ground of the warm and cold currents had, during the early summer, been pushed north-eastward to the line from Minnesota to New England, instead of the ordinary Missouri-Ohio line.

G. H. STONE.

Colorado Springs, Aug. 23.

Professor A. Graham Bell's Studies of the Deaf.

I AM always ready to welcome intelligent criticism of my labors on behalf of the deaf; but the articles published in *Science* (Aug. 15, pp. 85-88; Aug. 29, pp. 117-119) from the pen of Mr. W. J. Jenkins unfortunately contain so many misstatements of fact as to render reply distasteful.

Mr. Jenkins commences his criticism (p. 85) by "entering a gentle protest" against the truth of a statement I never made; and he ends it (p. 119) with a long paragraph containing a series of statements relating to the census of 1880, no one of which is correct. The intervening matter is so full of inaccuracies, that I should take up a great deal of your valuable space were I to attempt to point them all out.

His chief objective is an attack upon what he calls my "theory of a deaf-mute variety" (p. 85); but he nowhere states exactly what this theory is, so as to enable your readers to judge for themselves whether or not his attack is well founded. Let me therefore supply this deficiency.

The theory referred to is contained in a paper, "Upon the Formation of a Deaf Variety of the Human Race," which I had the honor of reading before the National Academy of Sciences, Nov. 13, 1883 (see *Memoirs of the National Academy of Sciences*, vol. ii. pp. 177-262).

In the preface (p. 130) the theory is formulated as follows: "If the laws of heredity that are known to hold in the case of animals

also apply to man, the intermarriage of congenital deaf-mutes through a number of successive generations should result in the formation of a deaf variety of the human race." For example: let some of the congenitally deaf marry congenital deaf-mutes; then let some of their deaf children marry congenital deaf-mutes, and some of *their* deaf children marry congenital deaf-mutes, etc., then the percentage of deaf children born of such marriages will increase from generation to generation, until finally all, or nearly all, of the children will be born deaf. The families of which this would be true would then constitute a variety of the human race in which deafness would be the rule instead of the exception.

Now, Mr. Jenkins is greatly exercised over the fact that all the distinguished scientific men whose opinions are quoted in the little pamphlet entitled "Facts and Opinions relating to the Deaf," admit this theory to be true. He gets over the difficulty, however, when he discovers that these gentlemen all belong to a scientific association of which I also am a member; and he says, "A member of their own fraternity has asked them their opinion on a theory of his own formulating; and, in complimentary deference to a great name, they have indorsed the theory."

I need make no further comment upon this than to say that the "fraternity" refers to no less a body than the National Academy of Sciences; and that the gentlemen who are so willing to subordinate their real opinions out of complimentary deference to me are Professor Edward D. Cope, Professor Alpheus Hyatt, Dr. H. P. Bowditch, Professor William H. Brewer, Professor Simon Newcomb, and Professor W. K. Brooks.

But to all his numerous mistakes Mr. Jenkins puts a climax when he credits the above theory to me. Such an error might be pardonable in one not connected with the Hartford School for the Deaf; but it is surely unpardonable that Mr. Jenkins should not know the author of the theory to have been the principal of the very school in which Mr. Jenkins himself is an instructor.

In my "Memoir" (p. 196) I quote the words of the late Rev. W. W. Turner, as follows: "It is a well-known fact that among domestic animals certain unusual variations of form or color which sometimes occur among their offspring, may, by a careful selection of others similar and by a continued breeding of like with like, be rendered permanent, so as to constitute a distinct variety. The same course adopted and pursued in the human race would undoubtedly lead to the same result. . . . Early consideration of philanthropy, as well as the interests of congenitally deaf persons themselves, should induce their teachers and friends to urge upon them the impropriety of intermarriage" (from a paper upon "Hereditary Deafness," published in 1868; for further references see my *Memoir*, p. 196).

The above is the theory for which I have so often been denounced. But the statistics of the "Memoir," to which alone I can lay claim, and which have led me to fear that a deaf variety of the human race is actually in process of formation in America, have never been seriously questioned.

Many statistics have since been collected by deaf-mutes themselves, and by their teachers, to show that there is no cause for alarm; but their figures all demonstrate that the percentage of deaf offspring born of deaf-mute intermarriages is many times greater than the percentage of deaf offspring born of the marriages of those who hear.

The testimony of the present principal of the Hartford School, Mr. Job Williams, is specially strong upon this point, although it is adduced to sustain the opposite contention (see *Facts and Opinions*, pp. 42–50).

In view of these facts, we cannot but note with alarm that many of the most prominent teachers of the deaf in America advocate the intermarriage of deaf-mutes. Dr. Philip G. Gillett, superintendent of the Illinois Institution for the Education of the Deaf, says (*Facts and Opinions*, p. 53), "I do not discourage the intermarriages of the deaf, as they are usually more happily mated thus than where one of the parties only is deaf. The deaf need the companionship of married life more than those who hear, and it is a gross wrong to discourage it."

Dr. Gillett is probably the oldest teacher of the deaf in America, —not oldest in years, but oldest in service, —and he is looked up to as a guide by very many in the profession.

Much good might arise from a comparison of views between Dr. Gillett and those scientific gentlemen who have given most attention to the subject of heredity. May I ask him, through the columns of *Science*, what would be his advice in such a case as the following?—

A young man (not a deaf-mute) became deaf in childhood while attending public school. He has one brother who is a deaf-mute, and another who can hear. Two others of the family (believed to be hearing) died young.

The father of this young man was born deaf in one ear, and lost the hearing of the other subsequently from illness. He had a congenitally deaf brother who married a congenital deaf-mute and had four children (three of them congenital deaf-mutes).

The mother of the young man was a congenital deaf-mute, and she also had a brother born deaf.

The paternal grandmother of the young man was a congenital deaf-mute, and she had a brother who was born deaf. This brother married a congenital deaf-mute, and had one son born deaf.

The great-grandfather of this young man (father of his paternal grandmother) was a congenital deaf-mute; and he was, so far as known, the first deaf-mute in the family.

Thus deafness has come down to this young man through four successive generations, and he now wants to marry a congenital deaf-mute.

The young lady has seven hearing brothers and sisters, and there was no deafness in her ancestry, but she herself is believed by her family to have been born deaf.

Dr. Gillett must not think that this is a purely hypothetical case, for it is not. The parties are engaged, but the marriage has not yet been consummated, and I know that Dr. Gillett's advice would have weight with the young people.

The teacher of the young lady has been consulted, and she feels her responsibility deeply. Her heart is with the young couple, and she desires their happiness, and yet her judgment is opposed to the union.

Will Dr. Gillett tell us what his advice would be in such a case?

ALEXANDER GRAHAM BELL.

Washington, D.C., Sept. 1.

Treatment of Snake-Bites.

IN *Science* of Aug. 22, 1890 (p. 107), it is stated that Professor Kaufmann strongly condemns the use of large quantities of alcohol in the treatment of snake-bites, as he thinks it paralyzes and depresses the nervous system.

Now, this paralyzing and consequent depressing effect of alcohol in snake-bites is just wherein its medicinal or remedial value lies; for by this paralyzing effect, tissue change and general metamorphoses of both the solids and fluids of the body are retarded, and the reactionary susceptibility of the system is blunted and benumbed; so that the venom is more slowly fed into the system, which is, by the paralyzing effects of the alcohol, rendered less susceptible to disturbing influences. Thus the *vis medicatrix naturæ* is given more time in which to eliminate, and in smaller quantities, the venom from the system.

This is another striking proof of the truth of the ancient aphorism, "Do not allow your theories to interfere with your practice."

Q. C. SMITH.

Austin, Tex., Aug. 26.

Temperature in Storms and High Areas.

ONE of the first practical discussions of this question was published in 1886 by M. Dechevrens, of Zikawei, China, and a translation of this paper will be found in the *American Meteorological Journal* for August, 1886. An independent investigation of this same question was carried on in this country before the above publication, the results of which will be found in the journal quoted above for October, 1887. The latter study showed that the temperature fluctuations were almost exactly the same, and had the same phases, both at the base and summit of high mountains, which was exactly opposite to the results obtained by M. Dechevrens. Dr. Hann of Vienna espoused the cause of M. Dechevrens, and tried to show that the observations at Sonnblick indicated the