like a solid isolated block into the life of the girl — we might say like a meteorite fallen from the sky. It is often felt that, when these college years are finished, everything connected with them is to come to an end, be set aside, the student herself is regarded as a finished product, turned off from a mysterious machine, to be henceforth separated from it as distinctly as a box from a turning-lathe.

All this habit of mind is again characteristically English — true English Philistinism, which is frankly indifferent to intellectual interest for its own sake — but accepts a prescribed intellectual drill as a means of attaining — it is not clearly apprehended what.

Removal of a girl from her mother's care, during the critical years of adolescence, must always be an evil morally and physically, even when it is an advantage intellectually. That is to say, it must be an evil, whenever the mother is adequate to her charge, which, of course, is only too often not the case. The girls are the exception whose health does not require constant and careful supervision, and it is absurd to expect such supervision from the girls themselves. A young person is a prig, who is competent, unadvised, to look after her own health. It is perfectly true that thousands of mothers prove themselves even more incompetent, either through indolence, or ignorance, or indifference. But, theoretically, we expect a mother to be watchful, well informed, far-sighted, and intensely solicitous. Such an anxious mother, if nervous, uneducated, and weak, may, indeed, do as much harm to the girl by over-fussing and spoiling as can the mother who is indifferent to the plainest laws of health; and the girl will do better, if removed to the impartial jurisdiction of a college faculty. But this is not then a change from good to better, but from worse to good by default.

The foregoing remarks have been suggested by surprise at the fact that relatively so few citizens of New York seem as yet to have become aware of the great advantage that has been brought to their doors by the foundation of the Barnard College for women in connection with Columbia University. Nearly half of the pupils thus far enrolled are not from New York City, but from without our gates,[1] and at the same time New York girls leave their homes every year for the colleges of other States — where they can only study under the disadvantages which have just been enumerated. Nay, more, these disadvantages are not counted as such, but on the contrary are reckoned as so many reasons for preferring the exile from home. For a quarter of a century the anomaly has existed that daughters of the wealthiest or the most highly educated citizens of the great city of New York have been deprived, except through such exile, of the educational advantages which were accessible to the inhabitants of a country town like Poughkeepsie. The parents must deprive themselves of the delight of a daughter's society during four of the most charming years of her life; or else deprive the girl of the "still air of those delightful studies" which should throw a charm over all her future life and lend a force to all her faculties. During four years all the marvellous development of thought and feeling which goes to the making of character, all the delicate details which go to the formation of manners, must proceed unwatched by the eyes that have the most intense interest in both, or else the babyish system of education must be continued, which arrests the intellectual training of a girl at the very point where, for a boy, it first begins to be strenuous. This injurious anomaly in our social structure was removed, or rather the first step was taken to remove it, when, in a measure, Columbia College opened its doors to women. Compared with what should be necessary when the girls of New York shall have come forward in proportionate numbers to claim the privileges of their university, the measure is slight and the beginning small. From this small beginning, however, a full university education for women cannot fail to grow so soon as the citizens of New York thoroughly appreciate, not only the value of such education, but the value of having its facilities at home, brought to their doors, when they realize that their girls may now claim their share in the intellectual inheritance of the race, without incurring the risks of expatriation from home which were already inherent in the boarding-schools of the sampler and crochet-needle, but are now too often laid to the account of a little Latin and less Greek.

[1] The Free Competitive Scholarship for the best entrance examination into the Freshman Class for the year 1890–91 was won by a graduate of the Jersey City High School.

CAN WE MAKE IT RAIN?[1]

The recent experiments in rain making in Texas, under direction of General Dyrenforth, and which have attracted the attention of the whole country, seem attended by a certain amount of success.

General Dyrenforth has proceeded upon the theory that heavy concussions in the upper air currents would cause a disturbance of these currents and thus produce rain. Consequently all his attempts have been to produce the greatest possible noise in the endeavor to cause a commingling of currents proper for a condensation of their moisture.

Every scientist knows, and a moment's thought ought to convince any one, that concussions cannot cause rain-fall. An explosion in the air is immediate in its effects. It becomes in fact merely the propagation of a sound-wave, which, travelling about eleven hundred feet in a second, has but an instantaneous action upon the air through which it passes, and in which it is gradually frittered away into heat. In a small part of a second the air is again the same in temperature and density. The greatest effect, then — the practical effect — must follow close upon the concussion. Therefore, if General Dyrenforth's tremendous explosions, his "air quakes," produced rain-falls in Texas, there should have been an immediate down-pour in that particular locality as a result of each explosion. But such was not the case. In every case, according to his statements, the rain has fallen from two to twenty-four hours after the explosions, and over extended areas. In a few instances, when rain-clouds were already present, General Dyrenforth says *drops* of rain fell within a few seconds after the explosions. The violent concussions may have had to do with the formation of these drops, but the true and only valuable rains came hours after every possible effect of the concussion had gone.

It is an observed fact that rains have followed the heavy cannonading of battles. But these rains did not fall until several hours after the concussions of the air had completely ceased. So, too, the proverbial showers of the Fourth of July come late in the afternoon or during the day following.

Further, it is noticeable that during a thunder-storm lightning-flash and its attendant thunder are usually accompanied by a sudden increase of rain downpour. This has been frequently attributed to the discharge of electricity in the clouds. But the increase and the flash occur so nealy simultaneously, that the rain-drops must have started from

[1] Since the above was presented before the University Science Cl Nov. 13, I have read with interest Mr. T. G. McPherson's excellent pre tion of Aitken's experiments on "Dust," in the Popular Science Month December, 1891.

the clouds above, before the flash. Otherwise they could not have reached the earth at so nearly the same time. In fact, Professors Ayrton and Perry show (*Phil. Mag.*, 1878, v., 197) that condensation is a cause for increase of electrical potential, and this may produce the flash, and not the flash the condensation.

If, then, the lightning is the source of the sudden and increased downrush of rain, in thunder-storms the same evidence precludes the thunder also as a cause. If General Dyrenforth's heavy cannonading and concussions could evoke the rain-drops, then much more should we expect the increase with the terrific reverberations of the thunder. But all the proof is against his sound theory. The heavy detonations, then, upon which General Dyrenforth bases his theory are unnecessary, and the success of his experimenting must be looked for in causes other than the noises of the explosion.

One turns naturally, then, to the products of the explosives. In General Dyrenforth's experiments, minute solid particles of silica and carbon were liberated as results of the explosions of the dynamite and rackarock. This fine dust, entering into the upper air-layers, might have served as nuclei about which the moisture could gradually condense to finally form rain-drops. When this has been accomplished the rain fell, and not before. Even where the immense oxy-hydrogen balloons were exploded, the dynamite batteries were for hours steadily throwing fine powders of silica and carbon into the air.

Now it is well known that hail-stones, which are products of the vapor condensation, often show a nucleus of a particle of dust, and in volcanic regions frequently of a granule of ashes. In these cases a dust-particle was the centre of the condensation. This fact furnishes strong evidence to support the theory, that very small particles of dust may form the nuclei of the rain-drops and that the sudden presence of fine powder in the upper strata of air will lead to condensation if sufficient moisture be present.

It is well known that during the first few strokes of an air-pump, a vaporous cloud appears in the receiver. Some ten years ago Mr. John Aitken, in studying the London fogs, proved that if the air in the receiver be first filtered through cotton-wool so as to be dust-free, then no vapor cloud appeared (Nature, Dec. 30, 1880, 195). He came to the conclusion, and stated it clearly, that no condensation will take place unless some solid nucleus as dust be present.

The writer has recently performed some laboratory experiments similar to those of Aitken, to seek corroboration of his results, and to determine any relative difference in the properties of different dusts as regards their power for condensing moisture. I find with Aitken that condensation under the receiver of the air-pump does not take place in dust-free air, and, further, that, with different powders introduced, the amount of apparent condensation varied. The experiments were then repeated without the air-pump as follows: Into a large glass sphere filtered air was introduced, and then a steam jet discharged into it. No trace of condensation was present. Then air containing products of sulphur combustion was put in, and a heavy condensation became visible. In a similar way, vapor clouds appeared with ordinary atmospheric air and with air containing gun-powder smoke.

In this way it was found that such powders as carbon, silica, sulphur, and common salt are particularly capable of precipitating the moisture, while the burning of sulphur or gunpowder gave heavy visible clouds of vapor.

Laboratory experiments cannot represent conditions which hold on a larger scale in Nature. Still they may be suggestive. So from these experiments it may be legitimate to reason that the finest dust introduced artificially into the higher regions of the atmosphere will furnish centres for condensation, and by gradual agglomeration of moisture induce a rain-fall. It must, however, be borne in mind, that there must be sufficient water vapor in the atmosphere above to gradually collect upon the dust. Therefore not under every atmospheric condition could a rain-fall be hoped for.

To prove and to make practical use of this dust theory, elaborate and expensive experiments would not be necessary. In place of the costly outfit required by General Dyrenforth for producing his terrific noises, upon which his sound theory depends; in place of the heavy mortars transported to the plains; in place of the immense retorts with acids and chemicals for producing oxygen and hydrogen gases necessary for his balloons, there could be substituted the relatively inexpensive fire balloons. By sending up a few of these there could be carried aloft a mile or so apart a quantity of impalpable powders. Then at the heighth of about a mile any feasible means of scattering this powder into the air might furnish the occasion for an artificial rain-fall. The burning of sulphur or gun-powder by fuses timed for the proper height of the balloons should also be tried.

It might be urged against this theory, that many instances may be cited where dust has been superabundant even in the upper air layers, and no increase of rain-fall noticed; that volcanic eruptions emit quantities of finest ashes to the atmosphere above, as did Krakatoa a few years ago, whose dusty breath circled the earth for many a month, and yet no unusual aqueous precipitations were observed. But it is to be remembered that if the number of the dust particles is excessive, the amount of moisture in the air, which is always limited, will be divided among so many that the agglomeration upon each will not be sufficient to cause it to fall as rain-drops.

If this dust theory be true, the amount of powder borne aloft and exploded from the balloons need not be beyond the limits of practicable experimenting. At least the experiments necessary to test the theory would be incomparably cheaper than General Dyrenforth's, and, if successful, artificial rains could be ordered at a cost which General Dyrenforth's explosive bombardments cannot approximate.

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NOTES AND NEWS.

DR. A. H. BEALS has been appointed professor of pedagogics and natural science, Georgia Normal and Industrial College, Milledgeville, Ga.

— At the sixty-fourth meeting of German naturalists and physicians at Halle, on the 22d of September, Dr. Below gave an important address on "Health in the Tropics." He came to the conclusion that the opening up of the tropics for Europeans was practically a question of hygiene, and that, with proper sanitary precautions, the most apparently unhealthy districts may be rendered salubrious.

— At the recent meeting of the Italian Congress of Internal Medicine initial arrangements were made for the next International Medical Congress, which is to meet in Rome in 1893. In what month of the year it will be held is an important question not yet decided, according to *The Lancet*. At midsummer, or in the early autumn, Rome is not likely to be found attractive to those who dread subtropical heat in a malarious vicinity. If held in the spring, or the late autumn, many teachers of medicine will not be able to attend. The last fortnight of September is what the