shine"[2] Mr. Very hangs the merit of his work on the exceptional clearness of August 8 and 9, 1912. It is very singular that these exceptionally clear days occurred when the effects of the dust cloud from Katmai volcano were at their maximum. At various high altitude stations the direct sunlight at high sun was reported to be reduced in August from 10 to 20 per cent., and skylight near the sun in daytime notably increased, yet it is at this very time that the moonlight scattered by the sky near the moon was so exceptionally small at Flagstaff.[3]

Thirdly. Mr. Very, in his paper submitted at Berkeley,[4] argues a high transparency of the atmosphere for the escape of terrestrial radiation, as opposed to the conclusion of Mr. A. Ångström. Very states "that practically all the terrestrial radiation which the atmosphere is capable of absorbing disappears in the first few meters of air traversed by the rays" and hence "the observed nocturnal radiation is a radiation to space," contrary to the opinion of Mr. A. Ångström that only a fraction of it is a radiation to space.

The phenomenon is as follows: A blackened surface at 20° C. is found to give off radiation at a rate of from 0.12 to 0.20 calories per square centimeter per minute when exposed to cloudless night sky. Such a surface would radiate about 0.55 calories if exposed to an enclosure at absolute zero. The question is: Does the nocturnal radiation observed (0.12 to 0.20 calories) represent radiation transmitted almost wholly to space, or is it in a large degree representing merely the radiation of the surface outward minus the radiation of the atmosphere inward? Mr. Very claims that for wave-lengths at which the atmosphere can absorb the rays, its full absorptive effect is produced within a few meters of the radiating surface. Here the temperature is not materially different from that of the surface, and re-radiation of the atmosphere in these wave-lengths approximates that of the black surface according to his view. Mr. Ångström, on the other hand, believes that many of the absorbable rays penetrate far into the atmosphere, where the temperature becomes much reduced, and hence the re-radiation is less than the outgoing radiation because it comes from a source at lower average temperature.

The point at issue is solved if it can be shown that increased length of path, or increased atmospheric humidity, do or do not affect nocturnal radiation. For the evidence see Table IX., p. 63, of A. Ångström's paper, "A Study of the Radiation of the Atmosphere," Smithsonian Miscellaneous Collections, Vol. 65, No. 3. Experiments were made at two stations on the radiation to small parts of the sky at different zenith distances. I refer particularly to observations at Bassour, Algeria, although Mt. Whitney observations support the following conclusions too. Length of path in the atmosphere is shown to be of decided effect. The change from air mass 1 to air mass 3 reduced nocturnal radiation on August 20, 1912, by more than 70 per cent. The result also depends on the degree of humidity prevailing, as is shown plainly by inspection of the whole table. These results show that the whole vertical thickness of the atmosphere is insufficent to absorb "practically all the terrestrial radiation which the atmosphere is capable of absorbing."

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[2] See *Astronomische Nachrichten*, Nos. 4,819–20, 1915.

[3] See in this connection Kimball, "The Effect Upon Atmospheric Transparency of the Eruption of Katmai Volcano," *Monthly Weather Review*, 1913, 41: 153–159, also, "Volcanoes and Climate," by Abbot and Fowle, Smithsonian Miscellaneous Collections, Volume 60, No. 29, 1913; also Kimball, *Monthly Weather Review*, September, 1915, p. 442, in which he shows for Santa Fé, New Mexico, elevation 7,000 feet, that as late as the last half of October, 1912, the mean solar radiation was only 1.37 calories at $z = 48°$, whereas he obtained 1.53 calories as the mean for the corresponding period of 1914.

[4] See *Pop. Ast.*, Vol. 23, p. 648.

UNIVERSITIES AND UNPREPAREDNESS

TO THE EDITOR OF SCIENCE: Some weeks ago an open letter from Professor Stewart Paton appeared in SCIENCE. It was entitled, "Universities and Unpreparedness." It suggested that universities could play an important part

in the solution of the problems raised by the war. It intimated that an increased amount of faculty, in contrast to trustee, government over our universities would contribute to this end. It requested that others who might have ideas on this subject should publish them.

Three points occur to me.

1. If the members of our university and collegiate faculties are given such a part in the direction of the policy of their institutions as Professor Paton suggests, and as Professor J. McKeen Cattell has contended for, they will undoubtedly be much happier and better satisfied with their station in life. With Professor Paton and Professor Cattell this appears to be a theory. For a Yale professor it is not a theory but a fact. For here at Yale professors have, in as full a measure as one could possibly ask the trustees to concede, the power of shaping educational policy and choosing colleagues. As a result we are an unusually contented lot of men. Perhaps we are too contented.

2. Professor Paton is in error I think in believing that this mode of university government makes for progressivism in education. The more people there are who have to be convinced of the wisdom of a new measure, the longer it takes to get the measure adopted. Yale under faculty government is not celebrated for radicalism. The great advances in which Harvard led were effected largely because of the aggressive spirit of President Eliot in support of new ideas. Experience demonstrates that presidents and deans are comparatively easily won over to changes of educational policy and methods. Boards of full professors are far less readily convinced, while general faculties including assistant professors and instructors are usually overwhelmingly dominated by stand-pattism.

3. The principal obstacle to the introduction of the idea of service into the work of our universities is the American college. On the whole our colleges are stronger in funds and prestige than all our professional schools and the other departments of our universities put together. The ideal of the colleges is almost universally that of diffuse culture as opposed to special training. For social reasons their students enter two years older than they should. For no reason that can be justified in utility they are kept for four years. Against every dictate of reason and service they usually work, even under the elective system, in a sort of lock-step which sets the pace for the most earnest by the average or even the indolent.

To develop American education so that it will turn out our young men prepared to be of service in the various highly specialized fields of modern life, the first essentials are to reduce the importance of collegiate education, to give the B.A. degree after two years of work, and to have accepted as part of this work whatever the professional schools want as preliminary training.

I doubt whether there is a sufficiently general comprehension in college faculties of the enormous handicaps which they now place upon professional education to bring about these changes within any reasonable time. Meanwhile a general introduction of arrangements between professional schools and colleges such as those involved in the six-year combined course for the B.A. and M.D. degrees, and similar arrangements for law and engineering, should be encouraged in every possible way.

It is only by the introduction of the vocational motive that collegiate instruction can be made serious, and the student freed from the idea that, as it doesn't matter what he studies in college, it makes no difference whether or not he studies at all.

For those who have no vocational object it might be well to institute a course coordinate with the professional schools, and leading to the degree of C.G.L. or Cultivated Gentleman of Leisure. The materials for it could easily be culled from the present list of academical studies. It would afford the needful university registration for the devotees of athletics, secret societies and other extra-curriculum activities.

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