the air-light in front of the dark object. Moreover, light scattered in higher layers of the atmosphere contributes a large part to the horizon-light, whereas the air-light in front of the dark object is produced in surface-near layers where relatively greater quantities of large depolarizing particles are present. Therefore the degree of polarization of the horizon-light must be greater than that of the air-light. This statement is implied in results obtained by C. Dorno,[2] who found that the difference between the polarization of the horizon-light and air-light increases with increase in distance from observer to object. Thus the combination of red filter and polarizing screen absorbs more of the horizon-light than of the air-light, lowering the contrast and decreasing the visual range.

Numerous visual and instrumental (Wigand's visual range meter) observations made by the author through combinations of colored filters and Nicol's prism under all possible weather conditions did not reveal any improvement of the visual range when the horizon-light formed the background to the sighted object. In no instance, not even under the most favorable conditions, could a dark object with the horizon-light as background be made visible by any combination of filters if the object was not visible to the unaided eye on account of haze (in the meteorological sense), fog or dust. F. Löhle[3] showed on a theoretical basis that the effectiveness of filters is bound to certain limits of the ratio (λ/r) of the wave-length (λ) to the prevailing radius (r) of the air particles. These limits within which an improvement of the visibility by means of filters can be expected are $1.03 < \lambda/r < 5$.

In the cases cited by Mr. Byram and those mentioned above where an improvement of the visibility is possible, the visual range is originally good. Therefore, the value of filters and polarizing screens for improvement of the visual range is negligible for all practical purposes.

If, however, the color contrast is of importance as, *e.g.*, in spotting certain objects on the ground from airplanes, the use of suitable filters may greatly facilitate the identification of these objects.

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SOME EFFECTS OF BINOCULAR VISION

FOR some years I have amused myself from time to time with experiments in the stereoscopic effects obtained by viewing objects and the landscape from different positions—that is, from upright and recumbent positions of the head. I am not a student of optics and I feel fairly sure that I have made no observations that are not well known to specialists, but conversations with friends have led me to believe that some of these effects are not very generally known, and I have thought it might be worth while to call attention to them.

We are so used to viewing things in the round by means of our binocular vision that we seldom stop to wonder at the really wonderful fact that so short a distance as that between the pupils makes it possible to judge the distance of an object even when its size is unknown and to see distant objects in their spatial relations with one another. A change in the position of the head, however, may open our eyes, so to speak. If we look at things, not in the usual way, but with the eyes in a vertical line, one above the other, we get a very different view. Now the trunk of a tree, for instance, is perceptibly flattened in appearance, but the individual branches are seen in the round, and this has the effect of emphasizing their horizontal lines, so that we feel that we have never really seen them before. A very good tree to try this experiment with is the white pine (*Pinus Strobus*) because of its habit of growth. Lying on my side in some pasture and looking at the pines along its border, I see the beauty of their horizontal branches as I never can when standing. The beauty of a mountain landscape, too, can best be appreciated from the recumbent position. As all mountain-lovers know, the wide-stretching views owe much of their charm to the successive shades of green and blue that rise one above another to the horizon. Probably only an experiment for himself will convince any one that these horizontal zones of color take on an added beauty when seen from a horizontal position, but seeing is believing, and it is an experience that I have often had. This emphasis of the horizontal lines, however, involves a corresponding suppression of the vertical lines, so that, as might be expected, the landscape thus viewed is noticeably flattened, and the summits appear to be considerably lower. Nothing is added to the grandeur of a towering peak, therefore, by taking the recumbent view of it. Indeed, quite the contrary is the case. But the beauty of wide-spread views of ranges and valleys is strikingly enhanced by this change in the position of the head.

Another experiment may be tried on a nearby ridge or a pasture slope across a dip. When one lies down, the slope appears to be rounded vertically, and, if it is a compound slope, every change in the pitch is accentuated. On the other hand, when one sits up or stands, the conformation of the ascent opposite is unnoticed, but every change in the horizontal contour is accentuated. Thus, if there should be a little brook or brook-bed running down that opposite slope, its course and the form of its banks would show much more clearly than they did when the observer was

[2] C. Dorno, *Veröff. Preuss. Met. Inst.*, No. 303, p. 253. Berlin, 1919.
[3] F. Löhle, *Meteorol. Zeit.*, 55: 54–61, 1938.

lying down. If one looks at an evenly rounded hillock at a little distance, the horizontal convexity is evident when one's head is upright, and the vertical convexity shows itself when one lies down or holds the head sideways.

I have not exhausted the subject, but perhaps I have said enough to suggest to some readers a source of interesting and amusing personal experimentation.

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THE OBLIGATION OF THE UNIVERSITIES

THE universities have, from all accounts, responded quickly and with a whole heart to the demands made upon them by the defense effort. In so doing they appear to have forgotten or to have disregarded their primary obligation to the community, as trustees of future leadership. With few exceptions, they have failed to insist upon deferment from military service of their graduate personnel, save in so far as such deferments are directly applicable to military defense. As a result, the personnel of those curricula from which immediate assistance is not needed is becoming seriously depleted. Many students of promise have been called into military service; others are shortly to be called; still others are transferring to departments in which deferment is likely to be had because of technological needs. The preservation of scientific research apart from its technological applications has seemingly received scant consideration. It is incumbent upon the universities to insist that this process of disintegration be halted before their primary function in the state is impaired, as it must be if deferment is not granted to promising candidates who would be expected presently to assume leadership and themselves direct the course of science.

We are faced with an emergency in more than a military sense. It is no longer a question of a year's service in a civilian peace-time army. It is now a question of the balance which must be struck between the various activities of the community as they affect our survival as a free people. It is a question of the intelligent direction and employment of human resources to achieve not only the military decision which we must achieve, but the utilization of it when the military effort is no longer needed. It is, I am convinced, now a question of the survival of science itself.

Science is an integrated whole. It is not physics and biology and chemistry. It transcends these disciplines and many more. It is a view of life and human effort based upon a continuous body of information which is being and must be constantly augmented. Its essence is the essence of democracy: of the free inquiry of individuals and the worth of individual judgments which are based upon observed and demonstrable fact. It is the very brain and nerve-center of our American civilization. Its antithesis is authoritarian dogma. It is a fragile fabric which depends upon warm human contacts from generation to generation. It can not be embalmed in printed words which later generations can discover in some tomb. It is a process, living and continuous, which rests not alone upon the research of a given master but upon the continued sharing of his experience and skills with the apprentice.

We are engaged in a struggle which is to determine whether our way of life and the scientific approach which is its base shall survive. The military effort is the present aspect of this struggle. In the long run it is not the decisive one. It can do no more than secure the ground over which a future more rational advance can be made. But it, no less than the non-military activities of the community, is finally dependent upon the resources and authority of science. Should army service be permitted seriously to deplete the oncoming personnel of science, particularly those to whom the universities and the community must look for leadership, its legitimate and mandatory activities will disappear and technology will wither at its source. We shall face the far-reaching consequences of a lost generation of leaders. The last war was won by a generation which was lost, and with their loss was lost the peace of Europe which it was their tragic responsibility to organize. To disorganize scientific research now is to place in jeopardy the military victory, to handicap it is to handicap the whole struggle for the community, both in prosecuting the war and in procuring the peace.

The community has invested heavily of its time and wealth in these young men in order to fit them for leadership in highly specialized and vital callings which few are equipped to undertake. I can not believe that the best interests of the community are to be served by deflecting exceptional students from the course upon which they have been set in order to make a transitory contribution which in many cases can be done more effectively by others of different temperament. Their specific knowledge and skills, continually augmented, may be of immediate and practical use in ways as yet unseen. The utility of scientific information is unpredictable. The curtailment of their training over any extended period will mean far more than the cessation of activities to be picked up again at the same point; a positive loss will inevitably have been incurred which it may be psychologically impossible to regain. The future effect of such loss upon both civil and military needs is incalculable.

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