

specimen of 'onion skin' structure which was revealed after the usual metallographic polishing followed by etching in 1 per cent Nital. The accompanying photograph shows the structure observed.

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Aug. 26.

Measurement of Physical Fitness

IT is desirable to direct attention, once again, to the need for devising and standardizing an objective measure of physical fitness.

The advantages which would result from the employment of a method of assessing the fitness of physique independently of subjective impressions have long been recognized. Little, if any, consideration has, however, been given to the following aspects of the problems involved.

The grading of recruits to the Services in the pre-enlistment medical examination is, as is well known, to a very large extent over-determined by subjective, qualitative impressions. Cases occur in which initial grading is too high and de-grading has to take place after the soldier has spent some time in a unit for which he is unfit. Many cases occur, no doubt, in which grading is too low. Statistical considerations alone lead one to suspect that there must be great regional differences in the proportions allocated to given medical categories and in the proportion of total rejects in any area. One may suppose that some physicians, not unnaturally, lower their standards of grading in order to provide more front-line men, and the effect is to give too generous a picture of health and virility in the men whom they examine.

There are in existence techniques of assessing physical fitness which, although admittedly subject to improvement, would nevertheless almost certainly add to the validity of the current qualitative procedures and act as a check on their accuracy. Moreover, it should be possible to raise the value of the qualitative estimates by appropriately weighting the constituent elements, for example, sensory acuity, or cardiac condition, according to their regression on physical fitness as measured independently. The statistical problems are very similar to those that arise in the marking of scripts in examinations.

The time is surely ripe for a survey of fitness in the army at different age-levels. It is not unreasonable to attach a biological validity to the concept of physical fitness and to regard it as connoting the 'integrative action' of the organism as a whole, resulting from the efficient functioning of the component physiological processes, the neuro-muscular system, the endocrines, the sense organs and so forth. Apart from social and economic disturbances in selection, physical fitness so defined and measured should, in theory, approximate to a normal distribution. Indeed, the concept is analogous to the notion of general ability as measured by psychological tests. The former should be both easier to measure and possess greater validity.

Such an investigation as is here proposed would

provide information on the effects of different periods and types of training upon physique. Furthermore, since the medical history of each soldier is known, much would be added to our knowledge of constitutional predisposition to disease. From the eugenic point of view alone the task is worth undertaking.

JOHN COHEN.

A Peculiarity in Rainfall Variability

A SOMEWHAT perplexing and highly interesting peculiarity in the regimen of rainfall variation is this: all over the world, there is a much greater degree of uniformity in the relative variability of annual rainfall expressed as a percentage of the normal than in the absolute variability expressed as the actual deviation from the normal in inches or millimetres. As regards Great Britain, the late Mr. Carle Salter pointed out in his "Rainfall of the British Isles" that though the percentage variability is rather greater in the dry eastern than in the wet western districts, it is of the same order of magnitude everywhere, which of course implies that the actual differences in the quantity of rain from year to year are much larger in the wet parts. In fact, the deviations in the actual amount of rain above and below normal increase so systematically with the rainfall itself that they swamp the percentage values and become quite useless in comparative statistics.

Take, for example, a plus or minus variation of only 10 per cent, which is almost equally common all over Great Britain: this signifies so large a difference as 20 inches of rain between the wetter and drier year at a place, say, in Cumberland, with an average rainfall of 100 inches, as contrasted with the trivial range of 4 inches at a place on the coast of Essex with an average of only 20 inches; whereas if Nature worked more nearly by the absolute rule than by the percentage rule, a 10 per cent variation at the drier place should be balanced by a 2 per cent variation at the wetter. Evidently, in the natural scheme a few inches more or less of rain a year which appear conspicuous at a dry place count for little at a wet place, and in dry and wet years the total rainfall is not lowered or raised by similar actual amounts everywhere but by similar proportional amounts.

The physical interpretation of the peculiarity is no doubt this: in places of heavy rainfall, any intensification or abatement of the normally acting factors is likely to produce a proportionately large effect in actual quantity of rain, which will not be the case in dry places, though in some parts of the world there are erratic dry climates where very exceptional years of abnormally heavy rainfall point to the operation of unusual factors.

In general, it is remarkable what little interest writers on rainfall statistics show in the dependence of actual variability on the rainfall itself, merely remarking on the convenience or necessity of working with percentage values, as though this dependence were axiomatic and there was nothing more to be said. The proposition, however, is not self-evident to the preclusion of physical discussion. Even V. Conrad, who in a paper published in the *Monthly Weather Review* of January, 1941, demonstrates mathematically the close relationship between absolute variability and the magnitude of the rainfall itself, does not pause to reflect why this should