control and on "movie" days. The mean rise in temperature in 54 control days was 0.73°, while the corresponding value for 45 "movie" days was 1.69°. The differential rise on "movie" days was 0.96°, about the same as 0.93° obtained by direct comparison, with a t value of over 14 (using Fisher's method of statistical evaluation of significance) or one possibility in trillions that the difference was due to chance.

The second subject, a young lady in her early twenties and a "movie addict," attended motion picture shows 29 times in the course of two months, viewing 47 feature films, mostly in the evening, in many cases taking two temperature readings, at 8 P.M. and 10 P.M. Twenty-two 8 P.M. "movie" figures varied from 99.0 to 99.65, with a mean value of 99.42, while 30 corresponding control temperatures fluctuated between 98.40 and 99.40, with a mean of 98.95. The difference, 0.47° F, was highly significant (t value of 6.24), and the chance of its being gratuitous is one in a billion. Here, too, comparing the differences between the basal and 8 P.M. temperatures in a larger series, the mean rise on 83 control evenings was 1.15°, that on "movie" evenings 1.68°, a mean differential of 0.43° being about the same as by direct comparison (t value of 7.28). In this subject the 10 P.M. temperature readings, taken usually at the end of the second feature film, were lower than the 8 P.M. values, the mean of 24 "movie" measurements being 98.91, while 28 control evenings gave a mean level of 98.66, the difference of 0.25° being just on the borderline of significance (t value of 2.65). It appears that either the body temperature raising effect of the second feature was less than that of the first, or that the normal diurnal fall in body temperature late in the evening was too strong to be completely reversed.

In summary, on the basis of occasional data obtained on many subjects, male and female, and through an analysis of multiple readings on two female subjects, it appears that attending motion picture shows, though looked upon as "relaxation" in the sense of escape from the humdrum reality of existence, *is by no means relaxation in the physiological sense.* On the contrary, although the spectator remains in a sitting position for two or more hours, the subject-matter of the film evokes an increase rather than a decrease in muscle tension which manifests itself in a highly significant rise in body temperature of one-half to one degree F. It remains to be seen whether the collective change in the body temperature of a preview audience can be used to predict the box-office success of a film.

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GROWING RUBBER IN COSTA RICA

A PECULIAR paradox of the agricultural economics of Caribbean countries is the high population density and scarcity of agricultural land in the highland areas, while down in the coastal plains there lie tremendous expanses of flat lowlands which for centuries have waited for development. Some people have thought that the populations prefer the highlands because of climate and health factors, but closer inquiry will reveal the main factor to be primarily economics. Tropical lowlands can produce basic foodstuffs like corn, rice and beans, but no one has yet found a permanent export cash crop capable of providing the economic base that is essential for an integrated community growth. Bananas have been tried in spots, but it wears down the soil too fast for permanent communities to really develop. And thus we have gross waste of soil resources in the midst of an acute scarcity.

This problem, which has baffled statesmen for over a century, now promises to be solved, thanks to the efforts of the U. S. Department of Agriculture Rubber Field Station at Turrialba under the leadership of Dr. Theodore Grant. The first thing found was that by a process of cross-breeding it was possible to develop varieties of *Hevea brasiliensis* combining high rubber yield with resistance to fungus attack. Then Dr. Grant convinced a group of scattered small farmers that they could develop rubber plantings of their own by just putting a little spare work over that required to raise their marginal food crops, and letting the station provide the technical knowledge and the planting material at nominal cost. And thus a practically self-sustaining system of rubber cultivation was initiated at very low cost, and without the complications inherent to large corporate organizations, which have never been able to understand, or be understood, by the average Caribbean native.

The small-farm rubber program as developed by Dr. Grant fits nicely into the general scheme of tropical life because it provides a simple system by means of which the average marginal farmer of the lowlands can gradually build himself a definite source of cash income without interfering with his food-raising activities. And the fact that rubber is a permanent crop will encourage the people to stay put in one place and to evolve gradually into integrated communities instead of being mere transient squatters. In other words, rubber bids fair to provide to the tropical lowlands the same type of economic stabilization that the cultivation of coffee has provided to the highlands.

At the present moment there are only seventy-five small rubber farms in Costa Rica, with an average area of around one or two acres each, but the impor-

tant thing is not so much the total acreage as the fact that they are scattered over a wide region suitable for rubber cultivation; and that as such, they provide practical demonstrations and establish the base for the future growth of the rubber industry. It seems to this correspondent that further efforts should be made by the United States Government to encourage and greatly expand this program of growing rubber on small farms, not only because of the strategic importance of having ample supplies of natural rubber close at hand, but primarily because it provides an inexpensive manner of efficiently developing one of the unused resources of the countries of the Caribbean.

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SCIENTIFIC BOOKS

INDIVIDUALITY

The Biological Basis of Individuality. By LEO LOEB. 714 pages. Springfield (Illinois) and Baltimore: C. C Thomas. Price $10.50:

THIS is a great and memorable work. The book is a unified presentation of a lifetime of research on certain of the central problems of biology, of an investigation held to with rare tenacity, breadth of view and unity of purpose for nearly fifty years. The beginning was a paper published in 1897 on the transplantation of skin. That paper and its successors opened wide vistas, so that since that date the author, with many different collaborators at different periods, has published more than a hundred papers in technical journals, all touching this field. Now all results are brought together, in this volume, in relation with those of other workers in this field, and in their bearing on general concepts and problems; so that a unified encyclopedic treatise results. The author is conservative and eminently "sound" in his generalizations and conclusions; yet many of them are almost or quite "sensational" in their interest. The book has been under revision in the author's hands for fifteen years. It was first written in 1930 and has been revised or rewritten repeatedly since that time.

When tissues of an individual body are removed and regrafted to the same individual ("autotransplantation") there is little or no reaction against the transplanted tissue. But if the graft is from another individual, closely related ("syngenesiotransplantation") or of the same species but not closely related ("homoiotransplantation") or is from another species ("heterotransplantation"), there is a decided reaction of the host against the graft. This is shown mainly by the gathering of lymphocytes and their further activity, and by growth of connective tissue and blood vessels into the graft. The special character of this reaction and its intensity varies with the relationship of the graft and host individuals, the reaction being slight if the relationship is close, greater as the relationship is more distant. Thence emerges the central concept of the work, the "individuality differential" or in more general terms the "organismal differential." The difference between graft and host—their individuality differential—is obviously dependent on the different genes which they possess; it is greater as the number of differing genes is greater. Investigations in genetics have been largely devoted to the effects of genes taken separately. In the individuality differential Loeb finds a single unified effect of a large number of genes acting together. The character of the individuality differential is affected—so the evidence indicates—by many genes; perhaps by all those present in the individual. Thus two individuals differing in any number of genes show individual differentials of a corresponding degree of difference.

The individuality differential is "common to all the various tissues and organs of an individual," though its manifestation may differ in intensity in different tissues. Similarly, there are also characteristics that are common to all members of a species, genus, order or class; "these may be called species—genus—order—class differentials," all being in their totality designated as "organismal differentials." Such group differentials present a means of determining or judging the relative degree of relationship of organisms. Seemingly of a different character are "organ and tissue differentials," distinguishing different parts of the same individual. All these categories are justified and elucidated by extensive illustrative experimental results described in the body of the book.

In a twenty-three-page introduction is presented a valuable systematic outline or summary of the concepts and conclusions to which the work leads, together with a generalized account of the experimentation on which they are based. A first chapter of nine pages deals more technically with the aims and methods of the investigations: how the reactions of host and graft are manifested, methods most useful in the analysis of the organismal differentials; what experimental animals are most satisfactory, and methods of evaluating the different reaction grades. Later chapters are devoted to detailed description and discussion of experiments and results which justify the concepts and conclusions reached.

The author is led to deal extensively with reactions that are induced by the impact of parts of one in-