major movement being from a region of high concentration to a region of low concentration of the thing diffusing.

Such a definition will apply to all cases of the phenomenon, no matter how complicated. It is easily applied and avoids the misconceptions introduced by the use of inexact terms.

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A NOTE ON THE PREPARATION OF BIOLOGICAL SPECIMENS BY FILTRATION OF PARAFFIN

IT is only recently that the writer has seen and read No. 233 of the *American Museum Novitates*. This contains an article written by Dr. G. K. Noble and M. E. Jaeckle and entitled "Mounting by Paraffin Infiltration." Naturally I am interested in learning how these authors received the first suggestions of the possibilities of the method and how they have, with diligence and ingenuity, brought it to a high stage of efficiency.

A special reason for my interest in the matter arises from the fact that I may regard myself as the original inventor of the process. In Volume XIX of the *American Naturalist*, issued May, 1885, on page 526, I detailed the manner in which I filled all the tissues of various small animals with paraffin. Among these were small turtles, fishes, lizards, salamanders, mussels and earthworms. Noble and Jaeckle employ some media which were not at my command, but the result to be attained is the same. I congratulate them on their success.

It appears to the writer that economy of time might be effected, especially in the case of the larger specimens, by more use of injections of the hardening and clearing fluids into the body cavities, perhaps also into the alimentary tract, that seat of rapid putrefaction, and even into the blood-vessels. Certainly freshly-killed animals of moderate or large size will in warm weather begin to decay and become bloated by gases before the preserving formalin or alcohol can penetrate the skin and muscles.

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SCIENTIFIC BOOKS

Alcohol and Longevity. By RAYMOND PEARL. Knopf, New York, 1926, pp. xii + 273.

NOT only Professor Pearl's "Friends of the Saturday Night Club" to whom he dedicates this work, but his other friends and indeed the whole alcohol-interested public will find matter of great importance in this volume. It records a unique investigation in human life statistics and makes the results clear, even for the non-scientific reader. Doubtless many careful readers, who are students of the problem, will be surprised at Professor Pearl's finding on page 226:

> "In a fairly large and homogeneous sample of the working population of Baltimore the moderate drinking of alcoholic beverages did not shorten life. On the contrary moderate steady drinkers exhibited somewhat lower rates of mortality, and greater expectation of life than did abstainers."

The problem of the effect of alcohol on the duration of human life is inherently such that we must turn to large groups for our observations and "to the mathematics of large numbers, to the theory of mass phenomena, to interpret safely our observations." Few if any scientific workers to-day doubt the metabolism results of Atwater and Benedict in reference to the utilization of alcohol in the human body. These results have recently been further extended by Carpenter[1] at the Nutrition Laboratory, who has administered alcohol in the form of rectal enemata and finds the same promptness of oxidation as his predecessors. In the well-known study by Dodge and Benedict on the psychological effects of single doses of alcohol it is pointed out that taken the world over there are very many people who "regularly obtain a somewhat larger proportion of their total energy requirement (calories) from alcohol than from protein." Moreover, it is generally agreed now that alcohol is not a stimulant but a depressant. The results of many studies, including those by Dodge and Benedict and more recent ones by the reviewer, have shown that even small or moderate single ingestions of dilute alcoholic beverages tend to slow up and disarrange reflex and voluntary functions particularly at the time when the alcohol in the blood is on the increase. From these results it appears that we have in alcohol an environmental factor which the body can handle at least in moderate quantities, a contribution to nutrition that needs no digestion, that can to some extent replace other food, but that has a characteristic effect on the central nervous system. As a rule, people take alcohol not so much for its calories as for its colorful relaxing influence on mental life. But it is recognized as

[1] Carpenter, Thorne M., "Human Metabolism with Enemata of Alcohol, Dextrose, and Levulose." Carnegie Institution of Washington, Washington, 1925, Pub. No. 369.

an unsuitable potion for a tight rope artist, an aeroplane pilot, or even for that mundane creature the bank cashier. Subjectively time drags less after alcohol; the individual is not so hard to satisfy, his attentional field becomes somewhat narrowed and he experiences an added increment of interest in his own mental states. Will he pay a penalty of shortened life span for this, shall we say, semi-dreamy and often altogether pleasing existence? These are not the words and this is not exactly the line of argument used by Professor Pearl. He does not say that since alcohol exercises a depressant action (has been used for ages as a "night-cap") it might perhaps reasonably be expected to conserve the quota of human energy and spread it out over a somewhat longer time axis, as increasing the average number of hours of sleep might possibly do. The question of voluntary alcohol indulgence and life span is his problem in the present volume.

Professor Pearl states that his interest in alcohol as an environmental agent began about 1916 when he tried experimentally to modify the germ cells of domestic fowl by this agent. The alcohol was given by the inhalation method. The birds were placed in metal chambers which contained alcohol vapor at about the point of saturation. One hour's occupancy of such a chamber was enough nearly to intoxicate the usual bird. Daily treatment with alcohol was continued for two and one half years. The control birds were of course placed in a similar chamber, but without the alcohol vapor. The results were surprising in that the alcohol-treated birds lived longer than the controls, had progeny that showed considerably less prenatal and postnatal mortality, and as treated organisms demonstrated less incidence of such diseases as roup. The autopsy records are reported as showing no clear indications of the ravages of alcohol. Stockard has used precisely the same inhalation method over a long period with guinea-pigs and has obtained results which very closely parallel those of Pearl with domestic fowl. Professor Pearl in commenting on the striking results in reference to roup says, "A possible explanation is that the daily inhalation treatment acts as a disinfectant of the air passages, and the treated birds do not take the disease because its germs are killed or greatly weakened before they have an opportunity to get an effective foothold." The reviewer can see no reason why this same possibility can not be extended to include the treated organism's entire body surface. Aside from this disinfectant action on the skin and feathers, when the bird is first removed from the chamber the rapid evaporation of the alcohol from the body surface can not but exercise through cooling the usual stimulating effect on the skin. The experimental routine of Pearl and Stockard does not eliminate these external factors which can not be appraised without further data. Nevertheless the results on the fowl were surprising and served as a natural starting point in the study of alcohol and longevity in man.

In approaching the human problem one recognizes instantly that it is impossible to prescribe the hour's daily bath in alcohol vapor and most of the other conditions that can in general be so neatly controlled in animal experimentation. It might be supposed that the essential data were reposing in the record books of insurance companies quietly awaiting the coming of the man with the statistical mill. Professor Pearl largely explodes this idea, making clear that such companies in general are not geared to the research drive. They have not the machinery and as a rule have no interest in prying into the daily or occasional practices of their policy-holders after once they have been accepted. Census reports are of course of even less value in the study of this problem. His material has resulted from family history records obtained by trained field workers under his personal direction. At the request of the National Tuberculosis Association he began about 1920 a comprehensive study of factors concerned in the incidence of tuberculosis, "with special reference to genetic elements." The individuals selected for study were very carefully questioned in reference to the use of alcohol and tobacco because of the possible bearing of these habits on tuberculosis. The field workers stated their problem directly to each examinee and it is believed in this way got the most trustworthy frank statements that can be had. Starting with an individual known to be a case of tuberculosis the field worker traced the family history both backward to ancestry and collaterals and forward to descendants and their collaterals. Numerous environmental factors were taken account of. In exactly the same manner individuals known not to be tuberculosis cases were studied. All the material (both groups) "was taken from one socially and economically homogeneous group of the population of the city of Baltimore and Maryland; namely, what might inclusively be called workingmen's families." An item to be included in a history had to be corroborated by the independent testimony of at least two persons acquainted with the individual in question. For each individual studied there is a record for the kind and amount of alcoholic beverages used, the frequency or regularity of use and such habits at different periods throughout life. The field workers had no hint that these data would be used for a study of alcohol and life duration. These items "sharply differentiate the present material from anything available for the study of this problem in the records of insurance companies, or indeed anywhere else, so far as is known to the writer."

When it comes to the matter of classifying the material in reference to amount of alcohol used numerous difficulties are encountered. The first classification into (1) total abstainers, (2) moderate and occasional drinkers, and (3) heavy or steady drinkers, which was used when this material was presented as an appendix in Starling's "The Action of Alcohol on Man," was criticized as too rough a grouping. Hence eight groups are made for the present treatment: abstainers, three moderate drinker classes and four heavy drinker groups. In all these the question has been *the amount* and the degree of *occasional* to *steady* use. Supposedly the question of dilution has figured somewhat in placing a particular person. Another very important factor, which is in effect a matter of dilution, is whether the alcohol is characteristically, for the given individual, taken with or after food or between meals on an empty stomach. Most assuredly it is not just the total of alcohol dumped into the stomach that is worthy of chief note. The conditions that modify the rate of its getting into the blood and so of its gaining access to the various tissues including the central nervous system are highly important here. Together with the amount and rate of ingestion they define the dosage. A good deal of the so-called idiosyncrasy to alcohol probably consists in these varying conditions which modify absorption. If we take the famous hard drinker, Dr. George Fordyce, for whom Dr. Pearl expresses such unrestrained admiration (p. 68), it will be noted that this one-meal-a-day man did not begin on his alcohol until after he had started to eat. And considering the amount that he ate he could (the size of his stomach permitting) drink a great deal without having the gradient of alcohol concentration in his blood reach a toxic value.

Results are analyzed for 2,164 females and 3,084 males. These populations are classified under sixteen racial groups. In general the females distribute themselves 3.1, 29.8 and 67.1 per cents. for heavy, moderate and abstainer classes. For the three classes in the same order males show 27.4, 42.6 and 30.0 per cents. Scandinavian women showed the largest per cent., 17.6, in the heavy class, while Hebrew, Scotch and Welsh and Old American show 0 here. The Hebrew men give the lowest, 8.3, "heavy" value. Between the three general groups there was not much difference in weekly income. Divided into the eight groups we find that the "moderate in amount, unspecified as to frequency" is 86 per cent. men and 14 per cent. women, which indicates that women gave a more accurate account of their habits. In all forms of the "heavy" classes men constitute more than 90 per cent. of these groups.

The data for the 5,248 individuals studied are presented in numerous tables and graphs where various comparisons between different subgroups and against other data are made. Individuals who changed their group status are discussed. Those who decreased drinking show death-rates below the general population, while those who increased are as decidedly above, but this subgroup whose habits changed during life have not been included in the general actuarial calculations. Numerous questions of an actuarial nature are asked and answered and the author defends as justifiable the calculation of life tables from the material under review. In the case of Dr. Pearl's data a person drops out of "the exposed to risk" group only because of death, never because of a "lapsed policy." The material as a whole without distinction as to the several classes of alcohol users and in respect to both sexes shows a higher expectation of life at all ages than does the general white population of Baltimore, which naturally also includes alcohol users. Although the more refined division into eight groups is proposed there is a tendency throughout the discussion to lump all the "moderates" together for comparison against the abstainers. All the tables and curves show them to compare rather closely and in some the "moderates" make a slightly better showing in life expectancy. So it is possible for Professor Pearl to draw the following conclusion which he places in italics: "In the males the death rates for moderate drinkers are slightly higher than those for abstainers from age 30 to age 55 inclusive, but, in my opinion, there is no statistically significant difference in the specific death rates, in the range of age from 30 to about 70, between abstainers and moderate drinkers, in this experience. In the same range of age the heavy drinking group exhibits a markedly higher rate of mortality than either of the other two groups." A particularly interesting comparison is between 94 male abstainers. and 113 moderate drinking brothers of the abstainers. The death-rates are a little higher for the moderate drinkers up to the age of thirty-five, while after that they are a little lower.

The earlier evidence on alcohol and mortality is reviewed and there is an extensive chapter on racial effect of alcohol. There is a bibliography of 269 titles a large single fraction of which (Nos. 158–197) relates to alcohol and cirrhosis of the liver as a disputed question. The book is well gotten up and satisfactorily indexed as to subject and author.

Dr. Pearl feels constrained to disclaim more than once "any responsibility for the application of the results of this investigation to the business of individual living." Notwithstanding this no small amount of space is devoted to straightforward arguing for the "moderate use" and in the face of the disclaimer the author has certainly not been fortunate in his se-

lection of a final quotation to end his treatise. Dr. Pearl states it as his firm conviction that carefully conducted research with animals will in the long run produce more reliable and trustworthy evidence as to the effect of alcohol, as such, upon duration of life as such, including human life, than will any human data.

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REPORTS

THE WESTERN COOPERATIVE OIL-SPRAY PROJECT

THE use of oil as an insecticide has increased rapidly during the last few years. Much experimental work has been done by various agencies, but most of this work has not been coordinated in such a way that comparisons could be made. In order partially to overcome this difficulty, a conference of entomologists and chemists was held at Tacoma, Washington, June 30, 1926, chiefly at the instance of J. R. Parker, associate entomologist at the Montana Agricultural Experiment Station. At this meeting, the Western Cooperative Oil-Spray Project was formed. The participants in this project included the Canadian department of agriculture, the agricultural experiment stations of Washington, Oregon, California, Idaho and Montana and the United States department of agriculture. Mr. Parker was named chairman of the organization. As practically nothing has been published regarding the intentions or results of the project, this brief report is presented at this time.

A further conference was held in Spokane, December 5, 1926, which plant physiologists and horticulturists were invited to attend. The oil-spray problem is not merely entomological in scope. The physiological effects of oils on plants must be considered, as well as the chemical aspects of oil-sprays. It was decided to limit the project to work of a fundamental nature, that is, primarily to investigate the effect of various types of oils on insects and plants and to ascertain the best methods of emulsifying the oils. It is believed that work of this nature will be more valuable than work with oil emulsions that may be on the market. In order to coordinate the work, a definite plan was formulated and the investigators were supplied with uniform materials. This has made the work of the various investigators much more comparable than has been the case heretofore. And to quote from the memorandum of understanding between the various agencies, one result of the project has been "to broaden the knowledge of the individual worker by the exchange of ideas and brief annual reports on work accomplished and to establish mutual confidence and to avoid trespass in matters of credit."

One year's work has been completed, and the results have been discussed and further plans made at a meeting held in Spokane, December 17 and 18, 1927. As the agencies involved are chiefly interested in horticultural work, the investigations so far have been limited to fruit trees. Possibly the most striking feature of this work has been the need of careful observations on the part of plant physiologists and horticulturists as to the effect of oil-sprays on trees and their products. This has been more or less overlooked in the past by entomologists, possibly because of their inability to measure carefully such effects.

The project feels that the use of dormant oils is fairly well standardized, and recommendations can be made and have been made regarding their use for the control of the fruit-tree leaf-roller, scale-insects, aphids and red spider eggs. However, there is still much to be learned as to the best time for application and the effect of low temperatures following application, and this portion of the investigation is to be continued.

The use of oil for summer spraying is not well standardized. On account of this, manufacturers are continually changing their products. Good results have been obtained in the control of red spiders and the codling moth, but the application of a number of summer sprays of oil has often resulted in injury, in one form or another, to the trees. For example, the fruit of yellow apples is particularly susceptible to oil injury; and trees in poor physical condition may be more severely injured than those in good condition. Moreover, the use of oil with lead-arsenate may complicate the subsequent removal of the spray residue. For these reasons, aside from the use of a single application of oil of sufficient strength to kill red spiders, no recommendations for using summer oils can be made by the members of this project until further investigations have been carried out.

The members of the project engaged in the 1927 investigations were as follows:

Dominion of Canada, Department of Agriculture:
E. P. Venables, (Entomology), Vernon, B. C.

Washington Experiment Station:
Dr. R. L. Webster, (Entomology), Pullman
E. L. Green, (Chemistry), Pullman
Anthony Spuler, (Entomology), Wenatchee
F. L. Overley, (Horticulture), Wenatchee
W. A. Luce, (Horticulture), Wenatchee

Oregon Experiment Station:
D. C. Mote, (Entomology), Corvallis
B. G. Thompson, (Entomology), Corvallis
R. H. Robinson, (Chemistry), Corvallis
Leroy Childs, (Entomology), Hood River
R. K. Norris, (Entomology), Talent