The a scale representing the number of dollars paid.

The b scale representing the number of hours worked.

The c scale representing the number of men working.

	a = No. Dollars Paid	b = No. Hours Worked	c = No. Men Working
1st week	469	675	18
2d week	425	464	17
3d week	393	485	19
4th week	325	400	19
5th week	350	500	12
6th week	300	400	14

The quotient a/b will represent the hourly rate paid. The quotient a/c will represent the amount paid per man. The quotient b/c will represent the hours worked per man.

The radiant lines starting from the point of origin of the coordinate system are the equations of lines which represent a constant quotient. The location of the points given by the actual values of the table with reference to the radiant lines of each quadrant therefore determines graphically the actual value of each quotient.

For example, in the sixth week we observe the location of point 6 in the *first quadrant* between a rate of \$.70 and \$.80 per hour (actual value $300/400 = \$.75$).

In the *second* quadrant (as connected by the cycle line) the location of point 6 is between \$20 and \$25 a week (actual value $300/14 = \$21.42$) and nearer to the \$20 line.

In the *fourth* quadrant (as connected by the cycle line) the location of point 6 is near the 30 hours per week line (actual value $400/14 =$ \$28.57 hours).

If a longer period and a greater number of values are under observation, a moving average could be calculated and plotted in a similar way. There are a great number of data which have a similar relation to each other and may be presented and analyzed by this method.

Furthermore empirical data obtained by experiment may be subjected to this method and a possible positive or negative correlation of their respective movements determined.

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THE AMERICAN PHILOSOPHICAL SOCIETY [1]

The etiology, prophylaxis, and serum treatment of yellow fever: Hideyo Noguchi. *Leptospira icteroides* was first isolated in 1918 from cases of yellow fever in Guayaquil; later the organism was obtained from yellow fever cases in Merida, Yucatan (1919) and in northern Peru (1920). The finding has also been confirmed in Mexico by Dr. Perez-Grovas, who transmitted yellow fever from cases of yellow fever in Vera Cruz in 1920 and obtained cultures. The most recent confirmation has come from Dr. Le Blanc of the Rockefeller Institute staff, working in Vera Cruz. The killed cultures of *Leptospira icteroides* were first used for protective inoculation against yellow fever in Guayaquil in 1918, where 427 vaccinations were carried out. The results were so encouraging (the morbidity rate among vaccinated and unvaccinated during the same period being 11 and 110 per thousand, respectively) that a vaccine several hundred times stronger has been made in large quantities and employed in Mexico and various Central and South American countries, the total number of non-immune persons reported vaccinated being about eight thousand. The development of protection is slow, requiring about 10 days for completion, and persons exposed to yellow fever just before vaccination or immediately afterwards are not protected by vaccination. Excluding such instances, however, there has been no case of yellow fever among the eight thousand vaccinated in the various localities, while among unvaccinated persons during the same period and in the same areas there have been about seven hundred cases of the disease. The use of vaccine furnishes a rapid method of elimination of non-immune persons from areas where yellow fever is epidemic. By the application of sanitary measures to eliminate the mosquito carrier and vaccination in the meantime to cut off the supply of non-immune material from the infected mosquito, a threatening epidemic of yellow fever in Guatemala and Salvador in 1920 is reported to have been checked within one month from the appearance of the first cases, that is, before a second set of cases had developed. The value of vaccination as an emergency measure does not, however, minimize the importance of the anti-mosquito operations, the elimination of both factors—the non-immune human being and the infected mosquito—being essential

[1] Abstracts of papers presented at the annual meeting, Philadelphia, April, 1921.

to the eradication of yellow fever. A therapeutic serum is also available for treatment of yellow fever. It has already been employed in 152 cases, and persons treated before the third day of illness have almost invariably recovered, the exceptions being those cases in which the quantity of serum used was too small to have any effect. By the fourth day of illness the injuries to organs are so great as to be irreparable in severe cases of yellow fever. The usual mortality in yellow fever, 50 to 60 per cent., has been reduced to 9 per cent. by the use of the serum. The records of vaccination and serum treatment presented here comprise the work of a number of observers. The initial vaccination experiments in Ecuador were carried out with the cooperation of Dr. Pareja and the Direccion de Salubridad of Guayaquil; the statistics from Central America cover the work of Lyster, Bailey, and Vaughn; for the records of Mexican cases I am indebted to the Consejo Superior de Salubridad (Drs. Vasconcelos and Casasus), to the Junta de la Sanidad de Yucatan (Dr. Hernandez), and to Dr. Le Blanc; the work in Peru was done with the cooperation and assistance of Dr. Kligler and the Peruvian health authorities.

Hereditary influences bearing on the resistance to tuberculosis: PAUL A. LEWIS. Certain inbred strains of guinea pigs, which have been maintained for a number of years at the Bureau of Animal Industry, Washington, D. C., have been tested by us as to their resistance to tuberculosis. It is found that these strains differ appreciably in the length of life after a standard inoculation. The differences between the strains are more considerable than differences due to other factors, such as sex, age, weight, etc. That the differences observed among the strains have a hereditary basis is also emphasized by the influence on resistance observed in crosses among these strains.

Signs of sanity: STEWART PATON. Probably the most important question in the world to-day is whether man is capable of directing intelligently the civilization he has created and organized. International as well as industrial peace can only be attained in proportion as we are capable of understanding and controlling human nature. Following the outburst of insanity in 1914, which plunged the world into war, no attempt has been made by statesmen or diplomatists at the peace conference to discriminate between the signs of sanity and insanity. In order to understand the nature of sanity one must use two methods of investigation: (1) analytical, (2) synthetical. Man has paid a heavy price for neglecting the latter. He has studied parts of the human machine, but has made little effort to notice the behavior of the entire machine. Judging sanity and insanity is a biological and not a psychological problem; it is not a question of body and mind, but of body-mind. The organization of the body-mind in sanity: (1) provides channels for discharge of energy in action; (2) assists individual to face squarely problems of actual life and (3) rewards effort by definite sense of achievement and feeling of adequacy. Bolshevism, radicalism and the tendency to think in terms of class distinction are defense reactions of inadequates afraid of facing their own personal problems. Success of individual, future of democracy and the fate of our civilization depend upon the recognition of these biological principles and the cultivation of mental processes favorable for sane thinking and acting.

Grass rusts of the Andes (based on collections by Mr. and Mrs. Holway): J. C. ARTHUR. The grass rusts form a peculiar group of minute parasites of great interest to the botanist on account of their curious and varied forms and of equal interest to the agriculturist and economist on account of the injury they do to crops, especially cereals. The Andean region embraces a strip rarely more than a hundred miles in width of elevated plateaus and high mountains extending along the whole western border of South America through Colombia, Ecuador, Peru, Bolivia and Chile. The cereal crops and forage grasses are of economic importance throughout the region, but a study of the rusts affecting them had made little progress until the exploration undertaken by the Holways. Barely a score of forms had previously been reported, but the number is now more than double, and includes some that are new to science. Much critical knowledge has also been secured.

The action of bases and salts on biocolloids and cell-masses: D. T. MACDOUGAL. The strong metallic bases, potassium, sodium and calcium are found to exert a limiting effect in concentrations of 0.01*M* on agar, when applied as hydroxides or chlorides, but this action is reversed when solutions diluted to 0.001*M* or 0.0001*M* are used, in which concentration they may occur in living matter. A similar accelerating action for hydrochloric acid at 0.0001 normal was found. Biocolloids of agar and gelatine showed specialized and accelerated hydration in similar solutions. No connection could be established between the hydrogen ion concentration and swelling as agar shows exaggerated swelling at P_H values

from 4.2 to 11. Effects as of balanced solutions were obtained with agar, and suggestions of similar action with agar-gelatine-salt mixtures. The incorporation of nutrient salts in agar and biocolloids in minute proportions such as might occur in plants increased the swelling capacity of some mixtures, in contradiction to earlier announcements by the author. Roots of various plants showed special effects in swelling, and also variations according to the ecological type of these organs. Such differences are determined by the composition of the cell-colloids. Finally the facts confirm an earlier statement to the effect that all substances known to facilitate growth of plants accelerate hydration of growing tissues, and of biocolloids simulating their protoplasm when used in low concentrations equivalent to those in which they are usually encountered by living matter.

Growth of trees: D. T. MacDougal. Extended measurements of the growth of many trees of a number of species have been made by the use of the newly designed dendrograph, which makes a continuous record of changes in diameter, and the recently perfected dendrometer, which registers total change in circumference. It is found that the period during which growth takes place even in equable climates with indeterminate seasons does not extend over more than two or three months, and that growth is not rhythmical in any sense, but depends upon food-supply, temperature, moisture and other environmental conditions. Awakening of buds, formation of leaves and flowers, and elongation of branches may occur many days or even weeks before trunks begin to enlarge. The leaves of a beech tree in Baltimore began to unfold April 10, 1919, and enlargement of the trunk began about May 18. Daily equalizing variations by which a tree may be actually smaller in mid-afternoon than at sunrise are greatest in the ash, pine, spruce, fir and walnut, and least in poplars, sycamore, beech and oak trees. Accurate measurements of the changes in trunks internal to the growing layer show that these variations are directly connected with the mechanism of the ascent of sap and are explainable upon the assumption of a rigid water column in a trunk composed of wood-cells and vessels capable of some shrinkage and expansion. Crudely expressed the trunk behaves like a heavy hose feeding from a pressure system to a fire engine. When the engine tends to take water faster than supplied, the hose tends to collapse; when the engine slackens its action, the hose swells.

Fishes of Ecuador and Peru: Carl H. Eigenmann. The fishes of the Guayas basin on the Pacific slope of Ecuador and those of the rivers of Chile are completely different in species. Even the genera with the exception of the mountain catfish *Pygidium* are all different. Excluding the marine fishes even the families and orders of fishes in the two areas are largely different. The differences between the two faunas are so great there is not a shadow of a doubt that in the main their origins were different. The Chilenian fishes came from the south. The Guayas fishes came from the Amazon. The Pacific slope of South America between Panama and Patagonia varies in width from a few yards in Colombia, west of the Atrato river, to a hundred miles or more. The slope is extremely wet in Panama and Colombia, varies from wet in the north of Ecuador to dry in the south of Ecuador. The slope varies from *dry* in northern Peru to *very dry* in southern Peru, and *almost* if not *absolutely dry* in Chile, south of Copiapo. The Guayas basin drains the area between a coast range and the Cordilleras of central Ecuador. The Guayas has the distinction of being the only river with a flow in the main parallel to the Andes. All the other Pacific slope rivers between the equator and Cape Horn (with the exception of the Rio Santa) flow direct from the Andes westward to the Pacific. The Guayas basin is the largest river basin draining into the Pacific between the equator and southern Chile. The rivers grow smaller south of Ecuador to northern Chile. A stretch of over 500 miles in northern Chile is crossed by but one river, the Loa. The first river south of the great desert of Atacama is the Rio Copiapo. I fished from Copiapo southward through central Chile over a stretch nearly a thousand miles long. The general conclusion reached is that the fauna of Chile is at its height between Concepcion and Valdivia. Going north from Valdivia one genus after another disappears. *Aplochiton,* a trout-like genus of Australia and Chile and *Galaxias,* another genus of Australia and Chile, reach their farthest north in the Bio Bio. The peculiar catfishes *Dyplomyste* and *Nematogenys* reach their farthest north in the Maipo. *Percichthys* reaches the Aconcagua. North of the Aconcagua in the region of the extinct or dying rivers but three species of the Bio Bio fauna remain: a "*peje rey,*" *Basilichthys,* the ubiquitous catfish *Pygidium* and *Cheirodon.* The little *Cheirodon* whose ancestors have come from tropical Brazil I caught as far north as Vallenar. In the Copiapo I caught no native fishes. The *peje rey* extends all the way to Lima, Peru.