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SCIENCE AND VALUES[1]

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A WISE custom recommends that this address be upon some topic in which substantial recent advances have been made and about which your retiring president is especially competent to speak. I have, nevertheless, chosen a topic about which very little has been learned in the past decade and in which I am not expert. The reason is that the topic is important for workers in all sciences, and is especially important now. You will all agree that wisdom in the wants and valuations which are the prime movers in human affairs has not kept up with knowledge of the brute facts of human nature, much less with knowledge of the lower animals, plants and inanimate nature. Foes of science are asserting, and some of its friends are admitting, that science is incompetent to improve the judgments of value and esteem which rule men. On the other hand, certain alert students of government, law and morals are suggesting that what is needed in the treatment of questions about good and bad, right and wrong, useful and harmful, is the matter-of-fact curiosity of science. So I invite your attention to some facts of the psychology of values, as I see them.

The facts about valuation have been much discussed under the title of "Ethics" and "Esthetics" by thinkers of philosophic temper. In spite of the great acuity and scope of their intellects, their efforts to devise general theories of the good or of the beautiful or of what men ought, and what they ought not, to enjoy have been unsatisfactory to philosophers as a whole, and rather mystifying or empty to men of science. Nor do they seem to profit by the general advancement of knowledge. Aristotle's solutions seem as good as

[1] Address of the retiring president of the American Association for the Advancement of Science, St. Louis, December 30, 1935.

Hegel's. Being extremely able men, they often propose ideas of great interest and influence, as do great poets and great theologians. But in cases where these ideas concern matters of observable fact, the observations and experiments of working scientists have often disproved their brilliant conjectures. To become a disciple of any of them in other matters is then risky. Their royal roads to knowing what is the right thing for each creature to do in each set of circumstances by learning what "The Good" is do not fulfil expectations.

Among the doctrines upon which they do show a high percentage of agreement is one which, though obviously true when taken advisedly, is likely to be a barrier to useful thought about valuation. That is the doctrine that the science (or super-science or meta-science) of ethics can be sharply distinguished from such natural sciences as biology, anthropology and psychology, since it is a normative science, telling what should be or must be, instead of describing what is and predicting what will be.

This doctrine is useful as a reminder that judgments that health, honesty and herrings are valuable differ from judgments that the Klebs-Loeffler bacillus causes diphtheria, that cheating in school children is negatively correlated with intelligence or that herring eggs will become herrings only under certain conditions. But it may do harm by encouraging us to argue and worry unprofitably about whether law, government and education can be sciences and what sort of sciences we should try to make them be. It may also frighten workers in the sciences of man away from observations of and experiments with values, and restrict them to studying only those parts of a man which he uses as materials and tools to satisfy his wants, neglecting the wants themselves.

Values vs. Mere Existence

Just what is the real and operative distinction between judgments of value or worth and judgments of fact or existence? Do the former concern categorical imperatives which are not amenable to the observations and experiments and predictions and verifications of the natural sciences? Must they be revealed by religion or deduced from some theory of a moral universe above or outside of the world of natural events?

My answer is that, on the contrary, judgments of value are simply one sort of judgments of fact, distinguished from the rest by two characteristics: They concern consequences. These are consequences to the wants of sentient beings. Values, positive and negative, reside in the satisfaction or annoyance felt by animals, persons or deities. If the occurrence of X can have no influence on the satisfaction or discomfort of anyone present or future, X has no value, is neither good nor bad, desirable nor undesirable. Values are functions of preferences. Judgments about values—statements that A is good, B is bad, C is right, D is useful—refer ultimately to satisfactions or annoyances in sentient creatures and depend upon their preferences. Competent students judge the existence of things by observations of them; they judge the values of things by observations of their consequences.

Values appear in the world when certain forms of preference appear, when certain animals like or dislike, enjoy or suffer, are contented or unhappy or feel pleasures or pains. They apparently precede learning and knowledge, which work chiefly in their service. Chicks or rats are indeed in a sense more confirmed moralists than civilized men. They pursue what is good, fit and proper to their minds with a wholehearted devotion. Their duty is often their pleasure also.

In civilized man the variety of the valued and disvalued increases greatly. There are many scales of merit, many points of view from which and in respect to which persons, acts, things, events, can be regarded as desirable or the reverse. One thing may have a score of different positive values and a dozen negative ones. The inborn values of sweet tastes, unimpeded movements, rest after exercise, exercise after rest, courtship and love, etc., are worked over into an enormous structure by the family, school, neighborhood, church, books, laws, and other man-made forces. Man acquires multifarious customs and traditions about values. Thus certain acts are good or right because they satisfy the tribal gods; others are so because they minister to the happiness of ancestors long since dead; others are right, one knows not why. Opinions about values become diverse and conflicting.

In assigning values on the basis of consequences, we may and do attach various weights to the consequences for ourselves, our friends, white men, black men and yellow men, sane, insane and idiotic men, dogs, horses, tigers and snakes, living men, the spirits of dead men and men yet to be, the God of our fathers and other gods, in case we recognize such at all. We also attach weight to remote and indirect consequences, for example, by way of the example set to others. There is also a large margin of guesswork, especially about what the consequences will be for the satisfaction of men of the distant future and men unlike ourselves. Opinions about consequences are also largely second-hand and conventional. The ratings by consequences are, however, always justified in the end by satisfactions or annoyances for some sentient being, if they are justified at all.

Alleged Absolute or Transcendental Values

We can choose whose satisfactions we shall give weight to and what sort of persons we shall esteem;

the two amount to essentially the same. But if sane and intelligent, we rarely attach value to something which makes no differences, directly or indirectly, to the satisfactions and annoyances of any sentient beings.

When certain moralists and theorists who are sane and highly intelligent give us the notion that they assert that certain qualities and acts can have an absolute intrinsic value, regardless of any satisfaction or annoyance to any sentient being, they or we (or both) are probably confused by analogies or verbal subtleties. It is to be observed that the qualities and acts alleged to be thus justified by their mere nature are easily justifiable as ministrants to real desires and aversions.

The commonest cases of alleged absolute values, irrespective of any satisfaction or annoyance to any sentient being, are truth, beauty and the development or perfection of human powers.

The truth, in the sense of those ideas about reality which correspond to it, enable us to predict it and lead us to adapt ourselves to it and to wants which are satisfiable by it, is a pure good. Anyone can possess it at no cost to anyone else and often to their enrichment; an increase in the amount of it available for men or in the amount of it possessed by an individual is, in and of itself, an aid in the satisfaction of other wants, and interferes with none of them. Whatever is an essential conflict with it is bad. Whether it has any more absolute warrant for commanding our regard we need not inquire, since even by the most empirical and utilitarian, or by the most metaphysical and supernaturalistic, theories it is valued as among the highest things a man may seek.

Beauty in the sense of that which causes unselfish, impersonal and noble enjoyment, free from exaltation of one at the expense of another's degradation, from use by one at the expense of another's deprivation, from taints of bestiality, meanness, stupidity, and the like, also ranks very high in any reasonable scheme of values. To make or to enjoy a poem that is fine satisfies good or at least innocent wants in the poet and his readers, without, in and of itself, reducing the satisfactions of any one else.

Creating and enjoying truth and beauty are samples of the class of satisfiers which involve positive satisfactions for some without subtraction from, and often with addition to, those of others. Enjoyment of the happiness of others is a third member of this class, and good health is a fourth. Other things being equal, such are obviously on the average better than what may be called the possessive or exclusive satisfiers, such as eating, ownership, supremacy or victory, where the satisfaction of one involves the deprivation of others. They are also samples of the dignified, as opposed to the trivial or mean satisfiers, such as chewing gum, scratching one's head or watching a dog-fight. They have fine consequences and fine affiliations; and these are enough to guarantee them without assuming any absolute or transcendent quality in them.

The doctrine that the perfection of human powers furnishes a general criterion and rule for valuation was probably invented and maintained because of the belief that there must be some one adequate universal criterion, and the fact that to be perfect, to be the best of a certain sort or series is very often good. Since some powers, such as to deceive, defraud, terrify and torment, are obviously better restrained than developed, the limitation, harmonious, is often inserted. Powers whose perfecting is undesirable can then be excluded as being out of harmony with those which the theorist thinks are better.

There need be no one universal criterion, and the idea of perfecting is of little real value save as a suggestion that the good life of any creature depends upon what kind of creature he is. The addition of "harmonious" brings the practical applications of the doctrine back to a calculus of actual wants and satisfactions of sentient beings and their interrelations.

Values then reside in satisfactions and annoyances of sentient beings. In so far as these lie within the natural world of men and animals, they are amenable to scientific study. In so far as we think reasonably, not by prejudice, wishful delusion or chance, we judge the values of things, events and relations by their consequences. We also sometimes judge them indirectly by their affiliations. The theory and technique of estimating the value of a thing by its affiliations—by what it goes with—is important, but I lack time to explain, illustrate and justify it, and to show its proper uses, dangers and limitations. The value of any given fact to any given group is, in so far forth, a natural fact like the smell or taste of any given chemical to any given animal. Values are not banished entirely from the realm of science into some exalted sphere. Facts, principles and laws about values differ from facts, principles and laws about time, distance, area, volume, mass, temperature, chemical constitution, memory, dreams, knowledge, prices, diminishing returns, laws, customs, myths, taboos, family organization, etc., not fundamentally and utterly, but in the very important features which I have described.

They are amenable to the methods of science. But they are often much harder to determine, since they depend upon knowledge about sentient beings, present and future, their wants, the right weights to attach to each of these, and the consequences of the act or fact in question to each of them. As a result, there is a very wide variation in the common-sense knowledge

which science starts with and seeks to improve. The variation in the weights given, often unconsciously, is especially influential. In the actual genesis of moral judgments one of you may, and probably does, weight the satisfaction of himself and a dozen of his family and friends above those of all the worms in the world; but some St. Francis or Brahmin may not. The saint may weight the satisfactions of any other Christian as equal to his own, but the average sensual man does not. The abstract thinker may give substantial weight to the satisfactions of the human species in 3000 A.D., but these vanish in the valuations of most men. Such habits and attitudes acquired and used in ordinary life are hard to exclude when one tries to judge impartially as if he were a trustee for the welfare of the world or a purely scientific solver of the world's problems.

The Assignment of Weights

Assuming that all human beings, present and future, are to be considered, how should an impartial student, a trustee for the welfare of all, assign weights? His criterion will be, as always, the consequences.

If the satisfaction of a certain want (say for food, or for power, or for approval) in A bids fair to cause great benefit to all men, whereas the satisfaction of the same want in B bids fair to cause little, he will weight A's want much more heavily than B's.

When it is not feasible to learn what the consequences of weighting one person's satisfactions more than another's will be, our trustee for humanity will do well to weight the wants of good men more than the same wants of bad men, since there is a probability that the gratification of wants will cause both to maintain or increase their customary activities.

Goodness and intelligence are positively correlated: so he will for the same reason do well to weight the wants of intelligent men more than the same wants of dull men.

He will do well to weight the wants of the men of 1950 above the same wants in the men of 2050, unless he has reason to suppose that the latter will be better men than the former, for there may be no men in 2050, and if there are, they may, some or all, lack the want in question. He will, however, give far more weight to the men of 2050 and 2150 than statesmen do or than most philanthropists have ever done.

Ethics, politics and philanthropy have been guilty of neglecting individual differences, partly because doing so simplifies all problems, and partly because of the retention of theological and sentimental prejudices in favor of the similarity and equality of man.

No egalitarian system of weights can be just or wise. More weight should be given to the wants of superior men than to the wants of inferior men. What able and good men want is much more likely to be better for their community or nation or race or the world as a whole than what stupid and bad men want. Providing for their wants will presumably enable them to do more of what they want to do; and this will improve the world and its customs for future residents. Other things being equal, it should lead them to have more offspring, and this will improve the world by increasing its percentage of good men.

It is of special importance to attach great weight to the wants of those individuals who have eminent abilities in the impersonal activities of art, science and the management of men. What such persons want will be largely time and freedom to do their work in, tools to do it with and conditions enabling them to do their best. They will doubtless sometimes want what is not good for their work for the world; but their judgment will on the whole be a good guide when knowledge of consequences is lacking.

It seems probable that the harmful vagaries of men of genius in the fine arts would have been much reduced if their cravings for untrammeled expression in art itself and for approval of their real merits had been more fully satisfied. It also seems at least possible that the ruthlessness and selfishness of some men of genius in business and government would have been reduced if they had been given power more and been less required to extort it by force. Even if these creators continue to seek occasionally eccentric, ignoble or ruthless satisfactions, it will still be an excellent bargain for the world to attach great weight to their wants as a whole. The world's greatest folly has been its treatment of those who are most superior to it in intellect, originality, sensitiveness and humaneness. Its most prudent investment is to find them out early, and give them whatever they need to do their perfect work. One good clue to what they need is what they themselves desire.

Human Wants

The work of a science of values, a realistic ethics, is to learn what men do want and how to improve their wants, and to trace the consequences of acts, events, ideas, attitudes, etc.

What are the fundamental and dependable satisfactions of life for man? A leading psychiatrist answers, "Love and security." But a student of boy's gangs may think that "Conflict and adventure" is as good an answer. The philanthropists of the early and mid nineteenth century thought that men would be satisfied if they and their children were without hunger and pain, able to read, with regular work ten hours a day and freedom to think and vote as they liked. Cynics of the twentieth century doubt whether people in general really want liberty and culture as much as beer and excitement.

I have no satisfactory answer, and no time to state the provisional answer which anthropology, psychology, sociology and the other sciences of man suggest. I shall instead report one small bit of evidence concerning what the inhabitants of this country want.

We do know fairly well how the population of this country spent their incomes in 1929. Using the figures given by Lynd and supplemented by Dr. Ella Woodyard, we have 17 billions for food, 8 billions for clothing, 6½ billions for automobiles, and so on through thirty items like a billion and a half for laundry, cleaning and dyeing, over a billion and a half for tobacco, to three quarters of a billion for death and burial.

The payment for food satisfies chiefly hunger, appetite and the want for sweet and savory tastes, but also in part the craving for social enjoyments, for the approval and esteem of others, for protection against disease. Payment for physicians is chiefly for protection against disease and pain, but also helps to satisfy the more general cravings for security, comfort, self-respect and the approval of others. Laundry bills represent the satisfactions of self-respect and social approval, protection against disease, pleasures of sight and smell, and others also.

By the aid of a consensus of psychologists, I have divided each item of our people's expenses among the wants to which it probably ministers, and then combined the results into a list of wants and the amounts paid for the satisfaction thereof. The outcome will suffer from whatever constant errors afflict psychologists to-day, but this inventory of wants satisfied from income is at least a step in the right direction. I shall not present it in detail, but only by samples. According to it:

Our bill for food is spent as follows: 56 per cent. to satisfy hunger; 15 per cent. to gratify the pleasures of taste and smell; 10 per cent. for the pleasures of companionship and social intercourse, including courtship; 3½ per cent. for the approval of others, and smaller percentages for protection against disease, protection against cold, enjoyment of the comfort of others and the pleasures of vision.

Our bill for clothes is spent (according to the psychologist's distribution): 41 per cent. for protection against cold, heat and wet; 6¾ per cent. for protection against animals and disease; 12½ per cent. for the approval of others; 7 per cent. for self-approval; 10 per cent. to gain pleasure in courtship and sex activities; 8 per cent. for other social intercourse; 6 per cent. for pleasures of vision; 3½ per cent. to win mastery or domination over others, and 2 per cent. to win their affection.

The 700 million dollars for cosmetics and beauty parlors is spent about one seventh for the pleasures of sight and smell, one fourth for the pleasures of sex and courtship, one third to gain general approval from others, one eighth to have inner-self-approval, and about one tenth to secure mastery or domination.

When the entire annual budget is thus transformed item by item into a budget for the satisfaction of human wants, payments for sensory pleasures, security, approval of others and the pleasures of companionship and sociability (including romance and courtship) are in each case close in magnitude to the amount paid for freedom from hunger. In fact, we pay more to maintain self-respect and the good opinion of others and avoid scorn, derision and shame than to keep our bodies fed and free from the distress of hunger.

We pay more for entertainment (including the intellectual pleasures and the sensory pleasures of sight, sound, taste and smell) than for protection against cold, heat, wet, animals, disease, criminals and other bad people, and pain.

Less than one third of what we spent went for wants which must be satisfied to keep the human species alive and self-perpetuating. The rest went chiefly to keep us amused and comfortable physically, intellectually, morally and especially socially.

Relatively little is paid for the satisfactions of the intellectual life. The psychologists consider that the payments for private schools, books and magazines are often for prestige, power and other practical satisfactions, and do not credit the theaters and movies of 1929 with much intellectual appeal.

The psychologists do, however, pay us the compliment of crediting us with spending twice as much from good will to man as from fear of criminals and other bad men, and of spending at least as much to win the affection of our fellow men as to have the pleasure of bossing them.

In tracing the consequences of ideas, acts, laws, customs, inventions, etc., both the biological and the social sciences have somewhat neglected the inner or mental wants of men. Nourishing food, hygienic housing, medical care, relief from bodily pain and fatigue have, quite naturally, been emphasized. But inner peace, contentment, a sense of personal worth, surety of friendship and affection, the absence of fear, the presence of a good conscience and other states of mind are also real and important.

Many features in religions, caste systems and other folkways which seem undesirable to us did have the merit of satisfying some of these deep inner needs. If we abandon such folkways on the ground that they are deceptive and unjust, we should replace them by something true and just which gives equal comfort, dignity and flavor to the inner lives of men. Doubtless it is better to be a dissatisfied Socrates than a satisfied pig; but also it is worse to be a dissatisfied coolie than a satisfied coolie. Most discontent is not divine. Not once in ten thousand times will becoming dissatisfied cause a coolie to become a Socrates. Some inner con-

flicts, miseries and rebellions are good, if not for the man's soul, at least for his work for the world. But many are not good for anything.

Theoretically, men should face the facts of the world, including all their own weaknesses and follies, make a reasonable adjustment and then live serene in the faith that they are doing their best and that all the good in all the world should and will support them so far as it can. But how can they be taught to do this?

The Improvement of Wants

The desires and aversions of men can be changed as truly as their ideas and habits, though not as much or as easily. The same forces of repetition and reward that strengthen tendencies to think and act operate upon tendencies to like and dislike. If a certain attitude can be made to occur in a person in connection with a certain situation, and if he is led to regard it as fit and proper in that connection, he will "learn" to take that attitude to that situation just as he learns to think "ten" in response to "seven plus three." In strengthening good wants and in attaching desire to good objects, there are, however, difficulties and limitations which are absent in the more neutral unprejudiced sphere of ideas and skills. Experiments in changing wants, interests and attitudes do not justify the fond hopes of certain doctrinaires in sociology and education, but they do guarantee that, if sound methods are used, men can be taught to find satisfaction in useful work, healthful and noble recreation and the welfare of others, to a degree that the world has never seen.

What is known concerning the inheritance of moral traits in man and the lower animals encourages us to hope that the inborn cravings of men may be improved at no cost to other goods.

Tracing Consequences

The consequences of events, especially of the ideas and acts of men, to the satisfactions of mankind, need study by all the sciences of man and nature.

Non-scientific estimates are sadly untrustworthy. The national prohibition of the sale of alcoholic liquors did not have the consequences which millions of people expected who worked to attain it. Who knows what its consequences would have been if the work that attained it had been quadrupled to secure its enforcement? Among all the consequences, beneficial and ruinous, blessed and dire, which were expected from the granting of votes to women, which were real? People accept guesses and follow the unconscious logic of hope and fear in estimating consequences, perhaps because they feel that good intentions are the important requirements.

People also naively expect that everything will stay the same except what is changed by direct action upon it. Nine persons out of ten, and possibly ninety-nine out of a hundred, assume that the general features of civilization which are stable in their experience will remain so. Roads, schools, policemen, houses, beds, payment for work, a chance to buy what you want if you have the purchase price and a hundred other commonplaces of our social order will continue like the sunshine or rain. So they think.

To think anything else is almost a psychological impossibility for the ordinary man of this country today. He does not realize that these features of his life depend upon an extremely complex structure of ideas and acts of rulers and ruled, employers and employed, parents and children, borrowers and lenders, and are kept in condition by an equally complex structure of customs and laws. He has no more fear that any act of his or anybody else will stop railroad trains from running than that it will stop the sun from shining. Laying a tax on incomes is to him like digging a ditch that diverts the rain from one place to another. He does not have the slightest fear that it will have any effect on the amount of income. Why should he? To do so he must reason, and reason against habit and experience. Only exceptional minds do that.

Scientific ethics must rely largely on economics, political science, sociology, psychology, education and biology in studying the values positive and negative of all sorts of activities; for example, paying prisoners full wages for their work, keeping criminals under surveillance by parole officers instead of incarcerating them, legalizing divorce when both parties desire it, encouraging birth control by the weakly, dull and psychopathic, taking property by force from the rich and giving it to the poor, trying to make one's own community or nation wax rich and strong at the expense of others by tariffs and quotas, and other moral or semi-moral issues, where action is now unfortunately being taken largely as a result of the emotional interests of enthusiasts or the selfish interests of special groups.

This lays a heavy burden upon these sciences, and cautious workers will be reluctant to take it on. Questions about consequences to human welfare are often confused by conventional interpretations of welfare; one is tempted away from fundamental inquiries which are really important to superficial questions which seem important to the public; the basic facts are often lacking; devising ways and means to secure trustworthy observations is very difficult; even after heroic labors, the solution may have a disgustingly wide margin of error.

So science has been rather willing to leave values alone. So psychologists rarely study the causes of happiness, economists recoil from all wants save those expressed in money prices, students of education deal with the consequences of school work upon abilities,

but not, save rarely, upon desires and satisfactions. So we all have left and still tend to leave decision about consequences to humanists—to philosophers, sages, men of affairs, historians and literary men.

Some of the humanists would gladly accept the responsibility, being confident that science should leave such decisions to them. They distrust the activities of the social sciences and especially their entry into the field of human values. It is better, such a humanist will assert, to listen to the seers and sages and to follow the dreams of inspired artists and moralists than to poke about in the schools, streets, market-places, prisons and asylums, or collect statistics, or drag human aspirations into the laboratory.

We may reasonably think that it is better to do both. We should admit that Thucidydes reports a better description of liberty than the average Ph.D. candidate in political science to-day would give. If we had to choose between reading Sophocles and Euripides and reading the most scientific family budgets, we would reject the science. We would have science gladly learn and gladly teach what able men have thought about the consequences of various forms of conduct, but we would also have it test and experiment, regarding nothing as outside the scope of science.

Much of the scorn of certain humanists for the efforts of modern science seems to be due to the fact that the observations and experiments of scientific workers make dull reading. A cardinal virtue of these humanists is to be interesting; many of them are literary men to whom success in entertaining cultivated persons is a duty, as well as a source of pleasure and pride. It is partly because of this that we can not trust the humanist alone. We must be suspicious of interest as a guide in any tracing of consequences. The talent for selecting what has a literary appeal may well be wrapped tight in a napkin and buried deep while one is doing scientific research.

We must consider one final objection to using the methods of science in the world of values. Science, according to a very popular view, deals with a fatalistic world in which men, their wants and ideals, are all parts of a reel which unwinds year by year, minor whirls in a fixed dance of atoms. Values can have no place in such a world, and efforts to attain them by science must fail.

The truth of the matter, which is rather subtle, may best be realized by considering what I have elsewhere called the paradox of science, which is that scientists discover "causal" sequences and describe the world as one where the same cause will always produce the same effect, in order to change that world into a form nearer their heart's desire. Man makes the world a better home for man and himself a more successful dweller in it by discovering its regular unchangeable modes of action. He can determine the fate of the world and his own best, not by prayers or threats, but by treating it and himself by the method of science as phenomena, determined, as far as he can see, by their past history. The only safe way he finds to gratify human wants and fulfil human aspirations is by learning the regular predictable modes of action of nature, especially those which relate to these wants and aspirations. The more fully he can turn the world into a progression of events devoid of chance, unswerved from its onward march by any magic, the more he can control it. If man should know himself as fully as he knows the chemicals he puts into a test-tube, so that he could predict the exact reaction he would make to any situation, he would be better able to control and improve his own future than any race of men or gods has ever been.

A deterministic world of science is the least fatalistic world there can be. A world entirely ruled by the wishes of deities external to it would be utterly fatalistic. It would present a far more hopeless determinism than the determinism of science, for human access to and influence upon those forces external to nature would be difficult and of doubtful avail, whereas the nature we live in and are parts of we may hope to influence.

The solution of the paradox lies in this last fact. Men are parts of nature. They and the scientific knowledge they acquire and the choices they make are on the reel, in the dance of atoms, among the marching events. Their wants and aspirations can determine nature's future because they are determined by nature's past. Everything that man is and does influences nature. Any ideas men have influence it. The knowledge of it as a complex of the regular "determined" sequences described in the so-called "laws" of science is the force that man can use most advantageously in changing men and the rest of nature to fit human wants. If and as the world is determined, there is hope of controlling it in the interest of human values. Every regularity or law that science can discover in the consequences of events will be a step toward the only freedom that is of the slightest use to man, and an aid in the good life. If values did not reside in the orderly world of nature, but depended on chance and caprice, it would be vain to try to increase them.

Are there any valid reasons why the methods of science should be abandoned in favor of either philosophical arguments or intuitional conclusions when one passes from facts of existence to facts of value? We have found none. It is certainly undesirable for men of science to restrict their thinking to what is and will be, leaving to propagandists and reformers and talkers the decisions about what ought to be. Is any group of thinkers qualified to study the wants of mankind, the consequences of acts and events, and the

improvement of human valuations without reliance on the facts and methods of anthropology, psychology, sociology, economics, government and other sciences of man? Can science avoid the responsibility of trying what impartial curiosity and honest work can accomplish in this field of controversy and prejudice?

The world needs the insights and valuations of great sages and dreamers. It needs the practical psychology of men of affairs, leaders in business, government and education. But it also needs scientific methods to test the worth of the prophets' dreams, and scientific humanists to inform and advise its men of affairs and to advise them not only about what is, but about what is right and good.

OBITUARY

THOMAS LEROY HANKINSON

ONE more member was lost to the decreasing tribe of real naturalists on December 3, 1935, when Thomas Leroy Hankinson died at Ypsilanti, Michigan, following a week of acute illness. Throughout his last several years of declining health, Professor Hankinson maintained the intense interest and enthusiasm which marked all his long career as teacher and researcher. A considerable number of biologists owe their initial inspiration and training to this man.

Born on April 12, 1876, at Valparaiso, Indiana, Thomas Hankinson was bereaved of his parents at an early age, whereupon he passed to the care of an uncle who lived at Hillsdale, Michigan. In this lake region the lad gained his unceasing interest in fish and bird life and natural history in general. He graduated from Michigan State College in 1898 and from Cornell University in 1900, and continued his studies in the latter institution for two years. From 1902 to 1919 he taught in Eastern Illinois Normal College; from 1919 to 1921 he served as ichthyologist of the Roosevelt Wild Life Experiment Station of the New York State College of Forestry; from 1921 until his death, he was professor of zoology at Michigan State Normal College; recently he acted also as research associate in the Museum of Zoology, University of Michigan. He served summers on natural history surveys or in conservation work for the states of Michigan, Ohio, Illinois, North Dakota and New York. He was a member of numerous scientific societies and served as president of the Wilson Club, as treasurer of the American Society of Ichthyologists and Herpetologists, as treasurer and vice-president of the American Microscopical Society, as treasurer of the Illinois Academy of Science and as vice-president of the Ecological Society of America.

Professor Hankinson was the author of numerous works on the ecology, life history, conservation and systematics of the animals of the several North Central states, particularly of fishes. He has left an even larger amount of unpublished data, including a large general work on the ecology of the Cyprinidae of the Great Lakes region. Much of the results of his work has been contributed to the researches and publications of his colleagues.

Professor Hankinson's life has been one of continuous service to his science and to his fellow scientists. May his tribe increase.

CARL L. HUBBS

RECENT DEATHS

DR. WILLIAM ELWOOD BYERLY, who retired with the title emeritus in 1913 from the Perkins professorship of mathematics at Harvard University, died on December 20 at the age of eighty-six years.

WILLIAM CARROLL LATTA, professor emeritus of agriculture at Purdue University, died on December 22. He was eighty-five years old.

DR. HOWELL T. PERSHING, professor of neurology and psychiatry in the University of Colorado, practising physician in Denver, died on November 30 at the age of seventy-seven years.

ALEXANDER MACDONALD, formerly New York State conservation commissioner, died on December 20.

DR. WILLIAM COLLIER, who was president of the British Medical Association in 1904, died on December 22 at the age of seventy-nine years.

PROFESSOR VICTOR GRIGNARD, of the faculty of science at the University of Lyons, died on December 13 at the age of sixty-four years. M. Grignard received the Nobel prize for chemistry in 1912.

SCIENTIFIC EVENTS

THE UNIVERSITY OF CAMBRIDGE AND DR. KAPITZA

THE University of Cambridge learned in April that Dr. Peter Kapitza, fellow of Trinity College and director of the Royal Society Mond Laboratory, was not returning from Russia to continue his researches with intense magnetic fields, for which special equipment had been provided. During the summer, according to a summary of the negotiations presented in the London *Times*, proposals were received from Russia