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THE GENETIC VIEW-POINT[1]

By Dr. ALBERT F. BLAKESLEE
DEPARTMENT OF GENETICS, CARNEGIE INSTITUTION OF WASHINGTON

$$(A + \frac{hD}{2}) \cdot (Z - \frac{hD}{3})$$

THAT I am a retiring president to-night is not my fault. I tried not to do it. I suggested to your secretary that in the future the president of the society make his retiring address the year after he presides and offered to forego or postpone my retiring address this year to set the scheme in operation. Your secretary refused to permit this innovation. (The American Naturalists, I now realize, is one of those societies which is run by the secretary). "I have had trouble enough now," the secretary said, "in trying to explain why the society elected the president they did. If the president should hang over another year before he retired, I should have either to remember the old excuses or to invent new ones. If I had my way," he said, "the formalities of the society would be confined to one day at the annual meeting. Let the president be elected and clothe himself with the insignia of his office in the morning, preside in the afternoon, and retire in the evening, at the Naturalists' dinner. The rest of the year the society can best do without a president altogether, while the secretary runs the society with the aid of his stenographer."

The secretary's arguments were hard to combat. So I tried next to obtain a substitute, an eminent foreign biologist who happened to be on a lecture tour in this country. This suggestion of a substitute met with the immediate (and I might say enthusiastic) approval of the secretary. All seemed working out to the welfare of the society as well as to the pleasure of the secretary, when I received a letter from my

[1] Presidential address delivered at the annual dinner of the American Society of Naturalists, Cleveland, Ohio, January 1, 1931.

substitute calling off his substitution. The secretary was helpful, as ever. He sent me a list of past presidents' addresses and offered fatherly advice: "Don't talk too much about your own work, but use it as a point of departure. Follow the trends of your predecessors." I have tried to comply with this admonition.

The reason for my title is two-fold. In the first place, it was necessary to send in a title, in response to the secretary's telegram, before it was possible to decide upon a subject for discussion. In the second place, it seemed desirable to follow the cryptic trend started by my immediate predecessor, if only to confirm the law of geologic evolution that too great departure from the normal may lead to extinction of the line. I may be sharing the thoughts of an armored dinosaur, if he had any thoughts at being the last of his line.

The last president took as his title "Kim Kurmah." He *said* it was Sanskrit and meant "Where are we at?" I am still skeptical as to what Kim Kurmahs really are. They sound to me more like a fermented health drink made from mares' milk and consumed in the Caucasus. Just to confirm a suspicion, I should like all those who looked up in the dictionary to see what the real meaning was of Kim Kurmah to please raise the right hand. No one raised a hand and no one here, therefore, looked up the meaning of these cabalistic words. Since Dr. Parker is not present to explain how he found his title last year, we may assume that he got the words only by hearsay. My simple experiment to-night with the members of the American Naturalists is encouraging to the present speaker. It shows what a retiring president of the American Naturalists can get away with when his audience knows he is actually retiring.

Now *my* title to-night is relatively simple. Its purpose was not to conceal thought but to develop thought. Probably many of you have already worked out its meaning as I had to do. As the secretary suggested, the formula is based upon Datura (D), the haploid Datura number of chromosomes (hD) is twelve, hD over 2 is therefore 6. If we remember our alphabet we will see that A plus 6 brings us to G. Similarly, Z minus hD over 3 means the subtraction of 4 from Z or the letter V. It will be seen that the formula $(A+\frac{hD}{2}) \cdot (Z-\frac{hD}{3})$ has thus given us the initials G.V. Since there are approximately 7,500 words beginning with the letter G and approximately 3,000 beginning with the letter V in Webster's unabridged dictionary, the initials G.V. could stand for any one of some 23,000,000 combinations. The announced topic, therefore, gave a rather wide choice of subject for discussion. If one were to use foreign words such as Sanskrit, the choice would be still greater [especially if one attributed meanings to such Sanskrit words without looking them up in the dictionary as the last president may have done]. In seeking two words to fit these initials I confined myself, however, to the English language. I tried to find a single word which would represent the most important concept in scientific research. This I believe I have found in the word "view-point." As a geneticist, I might reasonably be expected to touch upon genetic aspects. And the letters G.V. easily resolve themselves into the title "Genetic View-Point." In arriving at our subject for discussion we have used mathematics in the way in which we feel mathematics should be used in biology, not to lend an air of erudition nor as an end in itself, but as a means to an end.

It need hardly be argued that the mere accumulation of facts is of little value in science except as they are organized and contribute to new view-points. A species new to science, or a new 3 to 1 ratio, of itself has little interest to advanced workers. Loose sand and unrelated facts are of equal value in the construction of a concrete building and in the erection of an edifice of science. View-points may be good or bad, may be based upon a firm foundation of interrelated facts or upon assumptions and speculative analogy. In any case our view-points consciously or unconsciously determine the direction of our research and color the interpretation of our results. The establishing of fruitful view-points, and not the amassing of facts, is the goal of advanced research.

Evolution and the concepts of genetics form two major view-points of biology. The evolutionary view-point dates its birth from the publication of the "Origin of Species"—by general agreement the most influential book of the nineteenth century. The evolutionary view-point has not only revolutionized our ideas regarding the origin of species and given a meaning to a mass of facts in biology, but it has also influenced other phases of human thought. At its birth, it was at once realized that acceptance of the evolutionary view-point would render impossible a literal interpretation of the scriptures. It was at once bitterly combatted, therefore, by those theologians who were unable to adjust themselves to laying the emphasis upon the spiritual rather than upon the mechanistic values of religion.

The genetic view-point is almost wholly a twentieth century product, although the progeny test—*i.e.*, determining the genetic constitution of individuals from the character of their offspring, was developed chiefly in the nineteenth century. Mendelism was born, strictly speaking, in the nineteenth century, but the infant's birth cry attracted no attention. The child was kept in suspended animation for some 35 years, until 1900, when it was independently rediscovered by three botanists; Correns, deVries and Tschermak and taken out of cold storage. For this second birth, Bateson assumed the office of godfather and gave Mendelism and related subjects the name of "genetics." In the first decade of the twentieth century deVries gave us the mutation theory and another botanist, Johannsen, gave us the pure line theory. In the second decade, the banana fly was discovered as an object of investigation, and genetics became no longer chiefly a botanical activity.

The growth of the genetic view-point is too recent to need recounting in detail. It may be profitable, however, to compare it for a moment with that of the evolutionary view-point. We may use the progeny test of ideas and note the influence of these two view-points upon the direction of research. The new ideas of evolution stimulated observation and speculation and broadened the field of vision. It apparently did not increase experimentation. Darwin, to be sure, was a good botanical experimenter, but his disciples as a class did not follow this part of his example. Genetics on the other hand was born of experimentation and has made experimentation the basis and final test of hypothesis. It has thus limited speculation and narrowed the field of view.

It will be profitable to the biologist to know more of both these points of view. The study of evolution should, and I believe will, become experimental. Geneticists should take more account of the observations of those who have become familiar with plants and animals in nature, past and present. Life as we know it to-day is the resultant of a continuing series of experiments on a grand scale. They offer a challenge which the geneticist can not long continue to decline. The problem is a task for joint attack by workers with different view-points. An example is offered by taxonomy and genetics. These two fields appear to be separated at present by a fence of mutual distrust and misunderstanding. The taxonomist seems to think that the conditions of a genetics experiment are entirely artificial, and hence conclusions drawn from them have no relation to what exists in nature. Plants and animals under cultivation are not good species and hence not to be considered seriously by the taxonomist. I have been told, for example, that since the jimson weed was only a weed and not known in the wild, it was not a species; that I ought to study some real species from nature. Apparently the Datura follows too closely the pig, the cow and the plough of man. The taxonomist believes further that the characters shuffled so glibly by the geneticist are of trivial significance, with little or no influence upon survival in nature; and that taxonomic recognition of such genetic characters would render classification of plants and animals an impossibly unwieldy task.

The geneticist believes that the mere classification of the plants and animals of the world has reached the point of diminishing returns; that a "species new to science" has even less interest than the discovery of a new gene, since the latter may be put to work as a tester in helping to solve some of the problems in nature, while the new species may only help to swell the size of our taxonomic card catalogue. The geneticist accuses the taxonomist, among other faults, of lacking interest in the evolution of the forms he studies and of using trivial traits in his classification, which often shows little superiority to the Linnean system, so far as bringing out evolutionary relationships is concerned. The taxonomist is also accused of not caring whether the effects which he classifies are primarily genetic or primarily modifications brought about by the environment. In other words, the taxonomist is felt to lack both the evolutionary and the genetic view-points. These complaints from the two fields are admittedly extreme and only partially justified. It is a matter of congratulation that the fence between them has begun to be broken down in places. Taxonomists are known who have brought under cultivation the plants they were monographing, albeit not with the entire approval of their taxonomic colleagues. And geneticists have been known to study in nature the species with which they were carrying on genetic experiments and have even consulted the dead specimens in a herbarium.

Let us compare for a moment the effects of the view-points of evolution and of genetics upon the average individual, our much-quoted friend, the man in the street. The opposition of the public to evolution was immediate, violent, and the end is not yet. It would seem that the evolutionary view-point had deeply stirred our friend in the street. An analysis of the situation renders it evident that there is no natural opposition to the evolutionary view-point as such. The agitation which the theory has aroused was due almost entirely to its indirect effect upon established dogma of theology. Any other theory equally powerful in undermining the bulwarks of a mechanistic creed would have aroused as much opposition. That man has consanguinity with lower animals is not inherently abhorrent to the human mind as shown by the oriental belief of millions of people in the transmigration of souls and by the gods represented in Egyptian mythology as half animal in form. Man is most intently interested in the things of the present and the immediate future. In the year 1931 we can find plenty of men who would be willing to fight for their own wives and even some who would fight for other men's wives, but we would have difficulty in finding a man so far visioned as to be willing to fight for the wife of an ancestor a thousand centuries ago or for the wife of a descendant a thousand centuries to come.

Our friend in the street might still believe that the first man was constructed from the dust of the ground or he might have been led to accept evolution. In the latter case he might believe with Gregory that man descended from an ape-like ancestor who cavorted only in trees, or he might prefer Osborn's doctrine that man arose from a similar ancestor with another name, who ran flat-footed on the desert sands. But his acceptance of the evolutionary view-point in itself would not materially alter his philosophy of every-day life. The genetic view-point offers a contrast to the view-point of evolution. Its central idea—Mendelism—was fathered by a monk without opposition from the church. Its growth to the present day has not engendered distrust or conflict in the public mind. And yet the genetic view-point has in it the power to change the attitude of our friend in the street in regard to well-nigh all his human relations.

Now what are the attitudes of mind which the genetic view-point is capable of changing? They are for the most part ingrained beliefs or assumptions which unconsciously color one's thinking. An example may be taken from a patriotic document familiar to every schoolboy. The Declaration of Independence says, "We hold these truths to be self-evident, that all men are created equal." This proposition, like many others assumed to be self-evident, is certainly not true. Despite what biology has taught us in the 150 years and more since the Declaration of Independence, its statement regarding the equality of all men at birth is probably an unconscious assumption in the minds of the majority of mankind, at least in regard to various aspects of man's nature. If questioned, our friend in the street might admit that the child of Japanese parents would probably not have the same stature and complexion as American children. And yet he probably would assume that, could we equalize the differences in education and other environmental influences to which any two children of a given race were subjected, the performance of the two children would be alike.

Those with genetic training may find it hard to realize the prevalence of the belief that men are born with equal potentialities. And yet this belief is not confined to the scientific layman. It is found among trained scientists and even among those who have a high standing as investigators of biological problems. In a review of a recent book on behaviorism, the New York *Times* quotes J. B. Watson as saying, "I would feel perfectly confident in the ultimately favorable outcome of careful upbringing of a healthy, well-formed baby born of a long line of crooks, murderers and thieves and prostitutes. I should like to go one step further now and say, 'Give me a dozen healthy infants, well formed, and my own specified world to bring them up in and I will guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief and, yes, even beggar man and thief, regardless of his talents, penchants, tendencies, abilities, vocations and race of his ancestors.'"

Our quoted psychologist's declaration of independence of any genetic view-point is answered in a measure by critical experiments designed by another psychologist. The Seashore tests clearly show that humans do differ in their innate musical capacities and limitations. From our knowledge of genetics it is safe to say that in man no two individuals are exactly alike or ever have been; and, save for the possible exception of identical twins, probably no two individuals have ever been born with the same genetic constitution. Whatever politicians and others may say about the equality of mankind, the success of democracy is due to inequality, to leaders whom the majority learn to follow.

The genetic view-point regarding differences between individuals is opposed by current belief and by many tendencies in modern civilization. Uniformity seems to be the goal of conduct inculcated in the young. When young hopeful has shown a certain measure of originality in his behavior, grandmother is prone to lead him gently back to conformity with custom by the question, "Just think, little man, what would happen if everybody did as you have just done?" The logical reply would be, "What would happen if everyone were a grandmother?" Standardization has been a success in industry, but the genetic output of mankind—the production of children—will probably always remain a home industry rather than a matter of factory mass production. The products of this our literally infant industry need protection from the label of uniformity. Increased means of communication, movies and the radio, moreover, tend to make us look and act alike and are spoiling interesting experiments in different parts of the world in customs and ways of thinking.

An activity in which a thorough appreciation of the genetic view-point might materially alter present practice is our much-discussed educational system. Teachers expend their greatest efforts in attempting to raise low-grade students to average performance; but special capacities are inevitably pulled down toward mediocrity under a system in which uniformity is an unconscious ideal. From grades to graduate school, insufficient effort is directed toward discovering and developing exceptional talent. The road to a doctorate is prescribed and narrow. He that attempteth to enter in by any other way, even though bearing ample fruits of scientific endeavor, is seldom rewarded. I have touched on these matters elsewhere. Suffice it to say that genetics teaches us the tremendous value of the exceptional individual in man as well as in economic plants and animals. How exceptional capacity may be early recognized and how it may be utilized in the furtherance of man's social and of his biologic evolution is a major problem of mankind which the genetic view-point has helped to emphasize.

The genetic view-point teaches that every biologic reaction is conditioned by the genetic constitution as well as by the external influences to which the individual is subjected. In other words, what every living being is and does is dependent upon the constantly interacting factors of heredity and environment. An appreciation of the relative value of these two factors would affect our ideals and practice in social and religious justice, in charity and education, and in all efforts for permanent human betterment. The genetic view-point attempts to evaluate the relative influence of heredity and environment but has been led by experience to look first for genetic causes of biological phenomena. Our friend on the street is prone to look first, if not exclusively, for environmental causes. The attitude of mind is seen in many biographies. The independent, self-reliant disposition of a national celebrity brought up in western pioneer surroundings, and the love of nature of a biologist raised in constant association with the wild life of the forests in Maine have been attributed to the direct effect of their environments. The fact that others in the same environment have not been similarly affected seems not to have been considered by the biographer, nor the possibility that the parents of their heroes may have been drawn to these environments by qualities of mind that have been transmitted to their offspring.

The blue grass region of Kentucky may grow taller men than other parts of the country, but their tallness in stature may have little to do with the blueness of the grass or other environmental peculiarities of the state. The real explanation may lie in the fact that the early settlers of this region came from the tallest racial stock in Europe, as Davenport has suggested. Anthropologists believe they have evidence that conditions in this country have increased stature and affected other anthropological measurements, thus bringing about changes in the physical nature of man in America. We have been told, for example, that less use of the jaws and muscles of mastication, due to better prepared food, is reducing the teeth, the jaws, the breadth, protrusion and massiveness of the face. Environment is known to have a direct influence upon individual development and thus might reasonably be expected to affect anthropological measurements. In such case, however, the effects would hardly be expected to be cumulative. The differences observed may conceivably be due to differences in genetic constitution between the two groups measured. The human species is tremendously heterogeneous even within a so-called race and it would be extremely difficult to be sure of securing two samples in which the differences in genetic constitution would be negligible, especially if the samples came from different countries or from different generations. In the latter case, age differences might be a source of error. In both cases a geneticist could think of possible genetic explanations. The genetic view-point would urge caution, therefore, in seeking first an environmental explanation for anthropological differences. Similar suggestions might be offered regarding most other phases of the study of man in which genetically controlled conditions are so difficult of attainment.

Twenty-five years ago I listened to a symposium before the British Association for the Advancement of Science, in which it was debated whether chromosomes had any connection with heredity. The passage of time has settled the question. A mechanism of heredity involving the chromosomes has been established; and the conclusion seems amply justified that any changes must be gotten into the chromosomes in order to be inherited. The genetic view-point, therefore, would place the burden of proof upon those who ignore the known mechanism in their attempts to influence the hereditary stream.

The belief is common, in one form or another, that an environmental stimulus is capable of calling forth an hereditary response similar to the original stimulus applied. A pregnant mother is chased by a turkey gobbler and her child is born with a red birthmark on the throat. The blemish is diagnosed as a result of maternal impressions. Beliefs such as this, which run counter to the established mechanisms of heredity, are called superstition if held by the man in the street. If held by a biologist, they are often called Lamarckism. In both cases they indicate an ignorance or neglect of established mechanisms.

The expectation that induced changes should resemble the stimuli which initiated them is *a priori* improbable and opposed to the known cases of induced mutations. Much of the belief in the inheritance of so-called "acquired characters" is the result of wishful thinking. One who believes, for example, that a man's college education will affect the mind of his newly born children may be led to realize that it is capacity to respond, and not the response itself, which is inherited. One who believes he has an example of environmentally induced somatic modifications affecting the germ-plasm should be forced to prove that new factors for these changes have been gotten into the chromosomes. No such proof has yet been given for the inheritance of an "acquired character."

The pigmentation of races in the tropics, for example, has been considered an "acquired character" induced by the intense illumination, which has become inherited as a racial characteristic of tropical peoples. The differences in types of pigmentation in different races of man might have made a cautious student hesitant to propose the above explanation. Similar differences in pigmentation are found in man's nearest relatives, the anthropoid apes. Thus the chimpanzee has a pale skin and the gorilla has a black or negroid skin. Both live in the forests of equatorial Africa. Furthermore, pale pigmentation might even better be regarded as the more recent type, since dark skin pigment, at least that of the Negro, does not behave as a recessive character and recessives, so far as our experience goes, are more likely to be derived types. There is no critical evidence in support of the belief that the pigmentation of races is an example of the inheritance of an acquired character.

The evident adaptations of species to their surroundings naturally lead to the belief that in some way the environment has had a directive influence. Whether this has involved more than the elimination of the unadapted through natural selection is still an open question. But the rôle of natural selection still remains a major problem awaiting adequate experimental investigation. Experimentation has given us a mechanism of inheritance. Is it too much to hope that experimentation can give us also the mechanisms of evolution? Genetics has been largely confined to a study of inheritance. The origin of the term admits of a broader definition. The future geneticist may concern himself more with the problems of evolution. Evolution then may properly be considered a subdivision of genetics.

The mechanism of Mendelian inheritance, with unit factors dealt out to us by chance, may be an unpleasant idea to some. But whether we like it or not, it is an idea which is influencing our views of life. Responsibility and freedom of will, for example, have been much argued in the past. In future discussions of these subjects, philosophers must take into account the mechanism of inheritance.

You may be wondering why in such an assemblage as this I have been discussing the biological sins in attitude of the man in the street. My reason is that, so far as the genetic view-point is concerned, the man in the street is often a biologist. By biologist I mean one engaged in the study of any form of life, especially in this case including man. It has seemed less personal to discuss the man in the street, although beliefs differing only in form are held by our non-genetic brethren in biology.

Perhaps the most common evidence of lack of genetic view-point among biologists is shown in their use of biological controls. Many fail to realize that plants and animals which look alike may differ markedly in genetic constitution and hence in their individual response to selected stimuli. To take examples from our own experience, Miss Satina has shown that races of bread moulds (Mucors) which are indistinguishable in appearance, even when examined microscopically, may differ in sex, strength of sexual activity and in their biochemical reactions.

In the jimson weed we have what we call cryptic races. They resemble our standard line in all visible particulars, and even an examination of their chromosomes might reveal no differences. That they are unlike our normals, however, is shown, first, by the peculiarities in inheritance of certain genes, but only in plants with particular chromosomes extra; second, by modification of the morphology of certain extra chromosomal types when hybridized with them; third, by abnormal configurations of chromosomes (circles of four instead of pairs) in hybrids with normals; and also by other peculiarities of behavior under special conditions. Before the existence of these cryptic types was suspected, it was felt desirable to establish a purified race as a standard. We now have such a race, the result of 17 generations of selfing and once passing through a haploid. All our primary and secondary extra chromosomal types have been gotten into this standard line, and their peculiarities can now be compared without the haunting fear that other factors than extra chromosomes may be influencing their behavior. Our own results, therefore, are closely comparable among themselves. The results might not be comparable, however, if experiments were carried on with races from different countries even if these races were highly inbred. We now know enough of the distribution of cryptic types in nature to be practically certain that an investigator of wild strains of Datura from Europe would be unable to duplicate all the results obtained from our standard line of this species.

Comparable living material is as important to the biologist for accurate experimentation as is purified chemical material to the chemist. Species in nature or commercial varieties when subjected to careful analysis have been found to be a mixture of diverse races, or otherwise genetically heterogeneous. Many investigators without genetic experience, however, are satisfied with sunflowers grown from a packet of commercial seed or with guinea-pigs purchased from the trade for their biological material, although they may be insistent upon the purity of their chemical reagents. Such too common failure to realize that the living reagents may differ in their physiological responses has often led to conflicting results of different investigators, as well as of a single investigator, when working with the same species.

When results are easily evaluated, over-refinement in an experiment may be a waste of time, but it is well to recognize the sources of error before making short cuts in methods. It will probably be safer in starting an elaborate experiment to use pure chemicals and comparable biological material.

In plants, genetically comparable material may be secured by using cuttings of a single individual, or relatively pure races may be obtained by selfing for a few generations. With animals having biparental reproduction, purification of races is difficult. By continued brother to sister matings, however, strains can be isolated incomparably better adapted to experimental purposes than the ordinary run of laboratory animals. Such inbreeding of mice, for example, has led to the isolation of races differing markedly in susceptibility to inoculated and to spontaneous tumors. Medical investigators as a class seem only just beginning to realize the value of the genetic view-point. Perhaps of more value to the medical profession than another endowment for cancer research would be an international institute for the breeding of purified races of rats, mice, guinea-pigs and other biological test material. Investigators in different parts of the world might then have available a source of comparable living reagents.

In man, our worst experimental animal, such purification is impractical. Identical twins we have suggested as the only source of really comparable material in the human race, but their use for experiments is limited. In human experiments, in which controls are most needed, it is most difficult to get comparable material. In human problems, therefore, dependence is unavoidedly placed upon the dangerous methods of random sampling and statistical treatment and conclusions are often drawn from data which, with forms better adapted to experimentation, would be considered inadequate. It should not be forgotten, however, that the mathematical reliability of conclusions bears no relation to the difficulty in securing adequate data.

We have given an all too inadequate presentation of the need of the genetic view-point in the street and in the biological laboratory, and have pointed out how common has been its lack even in high places. We have reached the point in our discussion at which to inquire what we are going to do about it.

In research, a blending of view-points in cooperative investigations suggests itself as a remedy. The geneticist may find he receives more than he contributes in such cooperation.

For the oncoming generation we can strive to strengthen the genetic education. It seems difficult for one to come to think in terms of the genetic view-point without actually following the shuffling of genes in breeding experiments. We may not succeed in convincing our educational administrators that laboratory work is as much needed in genetics as in chemistry. We can at any rate encourage the growing of Drosophila and to this end might bring political pressure to bear to lower the duty on bananas.

In stressing the shortcomings in other fields of labor, my voice may sound like the voice of a preacher. I have tried, however, to follow the lines of least resistance and at the same time of greatest efficiency. We know more about the faults of others than of ourselves. If we were able to view ourselves from a distance and there were unlimited time, we might relate some of our own sins and give advice to geneticists. The pleasure of giving advice to geneticists, however, can more profitably be left to a later speaker who is not a geneticist. Advice, you know, is a commodity which it is more blessed to give than to receive.

In conclusion, we feel justified in believing the genetic view-point, with all that it implies, is the most important biological contribution of the nineteenth and twentieth centuries. It is still broadening its scope and influence, but even now it has within it the power to change profoundly our philosophy of everyday life. In any program for the salvation of the future of the human race, it will be necessary to have the genetic view-point somewhere in the formula.

AN OPTIMISTIC VIEW OF THE EVOLUTION OF THE SCIENCES[1]

By Dr. VIRGIL F. PAYNE
PROFESSOR OF CHEMISTRY, TRANSYLVANIA COLLEGE

THE American Association for the Advancement of Science has fifteen sections devoted to the activities of specific science or related groups. Science has been defined as accumulated and accepted knowledge which has been systematized and formulated with reference to the discovery of general truths or the operation of general laws. In this sense a specific science is any

[1] Address of the president of the Kentucky Academy of Science read on April 3 at a joint meeting of the Ohio, Indiana and Kentucky Academies.