

specific or subspecific value to differences which are due merely to some slight difference in environment. This, it seems to me, misses the whole point. What produces species and subspecies, anyway, except slight differences in environment, together with greater or less geographic isolation? And when we see these differences why should we refuse to admit their existence or their meaning?

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BREATHING OXYGEN.

THE experiments here described were carried out during the course of an investigation to determine the quantity of carbon dioxide exhaled from the lungs of different persons under stated conditions.

The method of procedure was as follows: (1) Ordinary air was inhaled through the nostrils and exhaled through the mouth (the nostrils being closed) into an inverted receiver filled with water. The quantity of carbon dioxide in the exhaled gases was determined in the usual manner. (2) A mixture of air and oxygen containing 26.4 % of oxygen was inhaled and exhaled as in (1). (3) Pure oxygen was employed and the experiments conducted as in (1) and (2).

The breathing experiments were made by three different persons, A, B, and C, under conditions as nearly indetical as possible.

The following results were obtained:

A		B		C		
Exp.	CO ₂	Exp.	CO ₂	Exp.	CO ₂	
1	3.8	10	3.6	19	3.8	} Ordinary air.
2	5.2	11	4.4	20	5.1	
3	5.6	12	4.6	21	5.8	
4	4.0	13	4.0	22	4.0	} Air and oxygen.
5	5.6	14	5.2	23	5.4	
6	—	15	5.6	24	5.6	
7	4.2	16	4.8	25	4.4	} Pure oxygen.
8	5.8	17	5.6	26	5.8	
9	6.2	18	6.2	27	6.4	

The figures given express percentages by volume; they are lower than those that would be obtained if the exhaled gases

were collected over water saturated with carbon dioxide. The object of the experiments was to get relative rather than absolute values. In experiments 1, 4, 7, 10, 13, 16, 19, 22 and 25, the gas (air, mixture of air and oxygen, or oxygen) was inhaled for five seconds and then exhaled for five seconds.

In experiments 2, 5, 8, 11, 14, 17, 20, 23 and 26 the lungs were inflated as fully as possible with the gas, which was retained *fifteen* seconds and then exhaled.

In the other experiments, 3, 6, 9, 12, 15, 18, 21, 24 and 27, the lungs were fully inflated and the gas retained *thirty* seconds before exhalation.

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THE SOCIETY OF AMERICAN BACTERIOLOGISTS.

THE following are abstracts of papers read at the first meeting of the Society of American Bacteriologists, held at New Haven, December 27th to 29th.

Natural varieties of Bacteria: PROFESSOR H. W. CONN.

Professor Conn exhibited some cultures of a highly variable *Micrococcus* which he had isolated many times from milk. Its color ranged all the way from a snow white to a deep orange, and in power of liquefying gelatin it ranged from a form that liquefied with great rapidity to one that had apparently no liquefying power. All these varieties, with numerous intermediate stages, have been found in nature and are not the result of cultivation. Professor Conn showed, however, what a great change can apparently be produced in the character of a species, by a simple process of selection. Starting with a pure culture of this organism, he was able to produce from it a white and an orange culture, by simply replating many times, and selecting the whitest color, on the one hand, and the

yellowest, on the other. At the same time, by selecting the colony which liquefied most rapidly and the one which liquefied most slowly, he was able to obtain from the same original culture, rapidly liquefying cultures, and those with hardly any liquefying power. He raised the question whether many of the changes which had been described as due to changed environment, might not really be due to such unconscious differentiated selection.

The significance of varieties among Pathogenic

Bacteria: PROFESSOR THEOBALD SMITH.

In the study of bacteria, morphological details are of but little value in differentiating and classifying forms because of their minuteness. Processes of conjugation and other sexual phenomena, such as are found among Protozoa, are unknown.

The problem of variation may be discussed under these heads:

1. The actual existence of bacteria whose relationship is conceded, although they manifest slight differences among themselves.

2. The artificial modification of bacteria by experiment.

3. The evolution of parasitic from saprophytic forms.

In the investigation of problems of this character it is necessary to study, not only the effect of related bacteria on the same host, but that of the same bacteria on different hosts. Our investigations should be both experimental and comparative.

(The variations occurring in the group of bacteria of which the rabbit septicaemia bacillus is the type, and those occurring in the pathogenic derivatives of the colon group, were discussed and illustrated. Variations among tubercle bacilli, in form and virulence, and among diphtheria bacilli, in the production of toxin, were also referred to.)

The modifications which bacteria under-

go, during passages through animals, vary in degree with the species and group under observation; with some, such as the rabbit septicaemia bacilli, streptococci, and pneumococci increase in virulence is easily attained; with the colon group this is much more difficult. The degree of change that can be impressed upon any bacteria probably depends largely on the specific structure of the organism.

The evolution of parasitic from saprophytic forms is a very slow and gradual process, whose mechanism may have differed with different species. Special advantages which a certain environment may offer for frequent passages through susceptible species may give certain saprophytes an impulse towards a parasitic existence. In any case, such saprophytes probably possess from the outset certain fighting characters, such as the power to produce toxins which enable the few among the myriads of forms, eventually, to become disease germs. (Published in the *Journal of the Boston Society of Medical Sciences*, January 16, 1900.)

Methods employed in the teaching of Bacteriology: PROFESSOR H. C. ERNST.

In response to a circular letter sent to the Institutions of Learning that teach medicine, as given in the 1899 volume of *Minerva*, there were returned ninety-eight replies. The letter asked for information as to whether Bacteriology was taught as a separate branch—in case it was not, in what department it was included—how many instructors were engaged in teaching this subject—the hours required—and other details of interest. It was found that forty-two institutions give instruction in Bacteriology as a separate department—twenty-six give separate courses, in connection with the department of Hygiene, and thirty-seven in connection with the department of Pathology, or Pathological Anatomy.

The increase in the numbers of teachers

of bacteriology in connection with medicine was noted, over the condition as found in the first volume of *Minerva* (1892).

(The full details of this investigation will be found in the *Journal of the Boston Society of the Medical Sciences*, Vol. IV., p. 67 et seq.)

On the changes of opinion in England in favor of bacterial purification of sewage: PROFESSOR L. P. KINNICUTT.

Professor Kinnicutt described recent experiments conducted in England which are producing a change in opinion as to the best method of treating sewage. Whereas, hitherto the chemical method of treatment has been commonly used, the belief is now rapidly gaining ground that the purification of sewage by bacterial growth offers the cheapest and most efficient method of purifying it so that it may be discharged into rivers without polluting them.

Recent work on sewage purification involving bacteria: H. W. CLARK.

The paper brought out clearly the fact that the benefit derived from preliminary anaërobic bacterial action upon sewage before filtration has been recognized at the Lawrence Experiment Station for several years, and calls attention to statements made, and investigations upon this point recorded in the reports of the Station for 1895 and 1896 (see report of Massachusetts State Board of Health for these years). It gives credit to Cameron for first practical use of anaërobic action with his septic tank at Exeter, England. Results of investigations upon production and purification of septic sewage at the Lawrence Experiment Station during 1897 and 1898 were given, with a comparison of intermittent sand filters and bacterial or contact filters. Rates of filtration of septic sewage, equal to 300,000 gallons per acre, have been attained with sand filters at Lawrence, and of 800,000 with contact filters, with satis-

factory purification. Investigations at Lawrence during 1898 have shown that open septic tanks are as successful as those made air-tight, owing to the scum of bacterial growths, fat, etc., formed over the surface of the sewage. Some experiments made at the Station seem to indicate strongly that anaërobic action may be carried to such a point that the resulting sewage is very difficult to purify.

The paper also gave the result of an experiment in which sewage during 1898 was passed through a filter of broken stone ten feet deep, at the rate of one million nine hundred thousand (1,900,000) gallons per acre daily, with very satisfactory results, nitrification being active, purification satisfactory, and the rate of filtration more than twice as great as ever before attained at Lawrence with crude sewage.

The significance of the appearance of B. Coli communis in filtered water: H. W. CLARK and S. D. M. GAGE. (Read by H. W. Clark.)

The purification of polluted waters by sand filtration has been studied at the Lawrence Experiment Station for the past thirteen years. Up to the beginning of 1897 the efficiency of the filters in removing bacteria was ascertained by determinations of the actual number of bacteria in the water applied to the filters and the effluents from them. For the past three years determinations of the number of *B. coli communis* in the applied water and effluents have been made. Especially has the efficiency of the Lawrence City Filter in removing this germ from the Merrimac River water been carefully followed. This was done, as it was believed that the significance of the appearance of the germ in the filtered water could be determined, because of the opportunity presented of studying its appearance in connection with the occurrence or non-occurrence of cases of

typhoid fever in the city of 55,000 inhabitants using this filtered water.

This city filter was built in 1893, and, while the death rate from typhoid fever in Lawrence for a number of years before its construction averaged about 12 per 10,000 inhabitants; the first year after construction the rate was 4.75 per 10,000 inhabitants, and this was followed by a steady yearly decrease to 1.39 in 1898. During this period there was no unusual disturbance of the sand filter bed, and its bacterial efficiency was good.

In the fall of 1898 it was necessary to relay some of the underdrains of the filter, and some of the sand beds were very much disturbed. When the sand was replaced and water was again passed through the filter the entire effluent was pumped to the reservoir and used in the city. Following the conclusion of this work, *B. coli communis* was found in 1 c.c. of 72 per cent. of the samples of the effluent of the filter examined during December; 54 per cent. of those examined during January; 62 per cent. of those examined during February; and 8 per cent. of those examined during March. The bacterial efficiency of the filter, or percentage removal of total numbers of bacteria in the applied water, was 92.20 per cent. from December 10th to 31st; 98.31 per cent. in January; 98.17 per cent. in February; and 99.89 per cent. in March.

During the period from the end of the disturbance of the filter in December until the end of the month there were twelve cases of typhoid fever reported in the city; during January, 59 cases; during February, 12 cases; but in March, when *B. coli communis* had practically disappeared from the effluent of the filter, there were but 9 cases, and these during the first portion of the month; that is, during the months of December, January and February there was an epidemic of typhoid fever in Lawrence.

During this period, *B. coli* was present in 1 c.c. of samples of effluent of the filter examined to the extent denoted by the figures given. When it failed to be found in 1 c.c. the epidemic had ceased. When 100 c.c. of the effluent were examined, *B. coli* was found more frequently, but the figures and facts in regard to the epidemic seem to show that, when filtering a river water as polluted as that of the Merrimac, it is safe to assume that, when *coli* is found only infrequently in 1 c.c. of the effluent, the typhoid germs, necessarily fewer in number, and more easily removed by the filter, have been eliminated from the water. The death rate of the city from typhoid fever in 1899 was 3.00 per 10,000 inhabitants.

On the detection of bacillus Coli communis in water: PROFESSOR E. O. JORDAN.

The direct application of the fermentation tube method to greatly polluted waters sometimes meets with a serious difficulty. This is the fact that other gas-forming species (and perhaps some non-producers of gas) overgrow *B. coli* and obscure or falsify the typical reaction. This appears to happen at least with some river waters more commonly than has generally been supposed, even when extreme dilutions are employed. One species that interferes often with the growth of *B. coli* is a variety of *B. cloacæ*, and when mixtures of pure cultures of this microbe and of *B. coli* are introduced together into fermentation tubes, the former frequently gains the upper hand.

A method that has given promise of overcoming this difficulty, and some others, is the following. The desired quantity of water is incubated in acid carbol broth, 1. c.c. of the required dilution being added to 5 c.c. of broth made 5 to 5.5 acid on Fuller's scale, and containing carbolic acid in the proportion of 1-1000. After inoculation at 38°-40° for 12 to 18 hours, platings are made in litmus lactose agar, and colo-

nies reddening this medium are tested for coagulation of milk, indol production, liquefaction of gelatin, and gas production in glucose broth. A recent comparison of the two methods has given the following results:

	Positive results.	Negative results.
Fermentation tube direct	21	34
Acid carbol broth	26	24

Although the number of experiments is small, the results indicate the distinctly greater delicacy of the latter method when applied to the waters used in these tests. The application of this method is interfered with, to some extent, by the same species that complicates the result in the fermentation tube, but the use of the litmus lactose agar facilitates the separation of *B. coli*, especially if the plate be examined within 24 hours after the sowing.

Demonstration of Actinomycosis and the Causative Fungus: PROFESSOR H. C. ERNST.

A specimen of very marked affection of the udder with the *Actinomyces* fungus was reported. Attention was called to the comparative rarity of the disease in this marked form, and the fact that the textbooks say but little about it as a possible source of infection. A number of microscopic preparations were demonstrated. (This case is also to be published in the *Journal of the Boston Society of the Medical Sciences*, Volume IV.)

A comparison of B. Coli communis from different species of animals: V. A. MOORE and F. R. WRIGHT. (Read by F. R. Wright.)

Different forms of *Bacillus coli communis*, from contaminated water supplies and variations of the same organism in tissues of different species of animals, have led to this investigation to determine the range of variation of *Bacillus coli communis* in (1) different species of animals, and (2) in the same species, always under supposedly

healthy conditions. As the work was not begun until late in the summer, this paper is to be regarded only as a report of progress.

The methods which were followed were:

(1) To take a loop-full of the mucus from the large and small intestines and inoculate a series of gelatin plates from each.

(2) To make sub-cultures from six typical spreading colonies which appear the same.

(3) To replat from these sub-cultures, to make sure of no contamination.

(4) From the second series of plates to make sub-cultures in the special media.

(5) To determine the pathogenesis by inoculating such experimental animals as the rabbit and guinea pig.

Thus far the results have shown that the organisms found in the horse, the dog, the cow, the sheep, and the hen, are more numerous in the large than in the small intestine.

The number of colonies from the same part of the intestine of the same species varies much, *e. g.*, in the large intestine of the horse, in some cases the colonies have been too numerous to count; again, there have been four or five hundred, and again, no more than a dozen. Where the number of *colon bacillis* was greatest, other species were few; where they were few, either a fungus or a micrococcus predominated in numbers. The most marked variations in the organism from the different species have been in the changes which they produced in milk, and in the various sugars and in their pathogenesis. The range of variation of the bacillus from the same species of animals has been found to be narrow.

The invasion of the Udder by Bacteria: ARCHIBALD R. WARD.

The extent to which lactiferous ducts of the cow's udder are invaded by bacteria, was determined by means of bacteriological

examinations of the udders of nineteen freshly slaughtered milch cows. Owing to the prohibitive expense of studying the udders of sound cows, it was deemed expedient to use those of cows slaughtered after condemnation by the tuberculin test. So far as possible, the udders of only slightly diseased cows were used. Samples of the fore milk were taken, and before slaughtering, the udder was milked as thoroughly as possible. The udder was removed from the carcass immediately after death and taken to a sheltered spot, for the bacterial examination. In each quarter in succession, a flamed knife was used to make an incision extending from the dorsal to the ventral region of the gland, and of such depth as to expose the tissue in the vicinity of its vertical axis. Bits of the glandular tissue were transferred with aseptic precautions to tubes of gelatin, and properly labeled to show the region from which the culture was made. After returning to the laboratory, the gelatin was liquefied at a gentle heat and poured in Petri dishes. By comparing the colonies appearing on the plates after several days, with those in cultures made from fore milk, it was possible to show that the same organism may occur in the fore milk in all parts of the udder.

The evidence appears to warrant a modification of the statements concerning the place at which milk first becomes contaminated by micro-organisms.

The writer concludes that, while milk is sterile when secreted, it may immediately become contaminated by the bacteria which normally inhabit the lactiferous ducts of the udder. (Published in Bulletin 178, Cornell University Agriculture Exper't Station.)

Exhibition of cultures and stained specimens of plague bacillus from two cases of Bubonic plague admitted to New York harbor, November, 1899: WM. HALLOCK PARK, M. D. Three slides were shown. The first was

from a twenty-four-hour agar culture showing, among rather short thick bacilli, peculiar long thick thread forms. The second was from a twenty-four-hour bouillon culture showing short almost coccus forms in chains. The third was from the spleen of guinea pigs dying of septicæmia, showing characteristic darker staining of the ends of the bacilli. Cultures were also shown on agar and gelatin. These cultures were of especial interest in that they were obtained from two persons, the captain and the cook, who arrived on a steamer from Santos, Brazil, in December, 1899, where the plague was prevalent. The two men when they arrived showed simply a large bubo in the lower inguinal glands. The temperature was nearly normal, and they did not feel ill. They had been sick about eleven days. They obtained the infection from a companion who had died and whom they nursed. Pus was removed from these bubos with a hypodermic needle. The pus from both cases contained the bubonic bacilli although in small numbers either living or dead. In culture they grew exactly like two other cultures which Dr. E. H. Wilson had obtained from India. Their violence was slightly greater than Dr. Wilson's cultures.

Some suggestions on the study of systematic bacteriology: FRED'K D. CHESTER.

Attention is called to a work now in progress in the arrangement of the better known species of bacteria. Certain typical forms or species of bacteria exist. These latter present certain definite morphologic, biologic, cultural, and perhaps pathogenic characters, which establish the types, independent of minor variations.

The most marked of these types become the centers of groups, around which are gathered related species and varieties.

Migula's system is followed as the basis or generic classification.

Tables were shown, giving arrangements of the bacteria in groups.

The necessity of some system of terminology for use in descriptive bacteriology was urged, and a table of definite terms presented. The question of nomenclature of species was discussed. Little or no regard has, in many instances, been paid by bacteriologists to the most ordinary rules of botanic nomenclature. This and the lack of knowledge concerning the synonymy of species has led to improper naming.

This was illustrated by a number of examples.

A new pathogenic fungus—the sporothrix of Schenck: PROFESSOR LUDWIG HEKTOEN.
(Read by Dr. Jordan.)

Schenck has described a case of subcutaneous, refractory abscesses, caused by a fungus which Erwin F. Smith tentatively assigns to the genus *Sporotrichum*.

In the case of a boy, five years old, under the care of Dr. Perkins of Shenandoah, Sava., an identical fungus was found to produce similar, refractory lesions as those described by Schenck; the process started in an abrasion of the left index finger, caused by a blow with a hammer, and during the next two to three months over twenty-five abscesses appeared under the skin and forearm. Ultimately, recovery took place.

The fungus was obtained in pure culture on two different occasions. It grows well in ordinary media, forming in the older agar cultures brownish, wrinkled and folded layers. Gelatin is slowly liquefied. Ær-obic. Thermal death point about 60° C. It has a separate branching mycelium; clusters of five or six spores appear around the ends of the branches and single spores develop along their sides. The spores are ovate or apiculate, from three to five mikrons in their longest diameter. Grams stain positive.

It produces chronic suppuration in the skin of mice and extensive ulcers; small, chronic abscesses may develop in the abdominal lymph glands after subcutaneous injection. In white rats intra-abdominal injection is followed by the development of numerous nodules enclosing small abscesses; the pus is thick and viscid, and contains oval and oblong gram-staining bodies in large numbers, but no thread. Pure cultures of the fungus are readily obtainable from lesions both in mice and rats.

Rabbits, guinea pigs, dogs and pigeons are immune. In guinea pigs and dogs, small subcutaneous abscesses sometimes form after injection under the skin.

The importance of bacterial tests in the sanitary supervision of milk supplies: MARSHALL O. LEIGHTON.

The investigations taken as a basis for this paper were made during the three years ending June, 1899, under the authority of the Board of Health of Montclair, N. J. Seventeen dairies were included in the report, the bacterial tests in each being confined to the determination of 'numbers per cubic centimeter.'

The average results for each dairy during the whole term divided themselves into three classes: First, those dairies having an average below 15,000; second, those between 40,000 and 70,000, and third, those above 180,000.

Comparing the foregoing results with the dairies themselves, as shown by stereopticon views of each, it was found that the dairies in class No. 1 were of the most improved type, in which the utmost cleanliness prevailed. Representing class No. 2, poorly equipped dairies were shown, in which the owners plainly endeavored to do their utmost with the crude means at hand to produce a pure product, but were unable to provide proper sanitary appliances to aid them; while class No. 3 represented those

dairies in which neither good equipment nor good intentions prevailed, but in which ignorance and indifference combined to produce poor dairies and unwholesome supplies. The comparison between the results of the determinations and the sanitary condition of the dairies was plainly marked in the photographic plates thrown upon the screen.

The practical importance of such an investigation was demonstrated in the publication of each year's results in the annual reports. The public have given them serious consideration and, in consequence, no less than a dozen unworthy dairymen have found their business unprofitable. In addition to this, several dairies have undergone a complete change in construction and in methods of production, and the supply as a whole had been raised to a high standard of purity.

Notes on the effect of blood serum from tuberculous animals and men on the tubercle bacillus when mixed with it in the culture tube and hanging drop: DR. W. H. PARK.

The serum was obtained through blisters from twenty-four persons, twelve having tuberculosis, and twelve not having any sign of the disease. The tubercle bacilli from a recent culture were ground up and a fine watery emulsion made. To this emulsion, divided into separate tubes, was added the serum from the different cases, to an amount such that in each case a 10 per cent. solution of serum resulted. Although in some the film forming on the slanted tubes was more tenacious than in others, no difference on the whole was seen between the dilution of serum from tubercular cases and that from non-tubercular ones. The result on the whole did not seem to offer much practical help.

On the bacteriology of canned goods, with a detailed account of bacteria detected in sour corn: S. C. PRESCOTT.

The paper described some investigations upon the bacteria present in preserved cans of corn which had become spoiled and 'swelled.' The cause of the trouble was found to be the presence of certain species of bacilli which resisted the temperature used in canning the corn. The same bacilli were found upon the fresh corn and husks.

Experimental and statistical studies on the influence of cold upon the bacillus of typhoid fever, and its distribution: W. T. SEDGWICK and C. E. A. WINSLOW. (Read by Mr. Winslow.)

A review of the literature on the subject of ice-supply and the public health shows that, while pollution of ice-ponds appears to have caused intestinal disturbance, no epidemic of typhoid fever has been satisfactorily traced to such a source. While it is known that cultures of the typhoid fever germ are not sterilized, the important question of the quantitative reduction of this species by freezing has been studied in only two limited investigations. The authors have, therefore, frozen large numbers of tubes of water inoculated with four different races of the typhoid bacillus, and determined the reduction after various periods. The results, twenty tubes being averaged for each period, show a rapid reduction in the first hour in freezing, varying from 30 per cent. in one culture to 60 per cent. in another; the reduction then proceeds approximately with the time of freezing, reaching a constant value of over 99 per cent. in two weeks. The last two or three germs per thousand appear to be very resistant, some remaining after twelve weeks of freezing. The four races used show constant individual differences in their susceptibility to cold. Alternate freezing and thawing was tested and found only slightly more destructive than continuous freezing. The destruction of the germ in cool, but

unfrozen water, followed the same laws, actual freezing causing only a slightly greater reduction than a temperature just above the freezing point. Finally, a few experiments on the formation of ice on a free surface showed that 90 per cent. of the germs present were excluded from the ice by physical processes. The authors conclude that the danger of typhoid infection from the small fraction of weakened germs remaining in natural ice is probably not a serious one, and that the results of their experiments are in harmony with the facts of experience.

H. W. CONN,
Secretary.

SCIENTIFIC BOOKS.

Psychology and Life. By HUGO MÜNSTERBERG.
Boston, Houghton, Mifflin & Co. Pp. xi+286.

Professor Münsterberg has here gathered together a number of essays, and has given to the collection the title of the first of the papers. The others are discussions of the relation of Psychology to Physiology, Education, Art, History and 'Psychical Research,' respectively. The chapters thus have a common starting point in Psychology from which they veer off in different directions. The author's special comments in these many fields it is impossible to reproduce here even in outline; we must confine ourselves to the more general doctrine presented in the work.

The book is in many ways an exposition, or at least the hint, of a philosophy; and to deal with it adequately would take one inevitably into deep water. With his main contention that Psychology is but a partial way of dealing with the mind, the present writer feels entire sympathy. It is important to have it put strongly by a psychologist that when we shall have catalogued all the facts of our mental life and have discovered their causal order—which is the purpose of psychology—there still remain the larger questions which have to do with the value and meaning of these occurrences. Psychology, like any natural science, is concerned merely with the facts; its aim is to describe and explain things; and to this end leaves out of account

the all-important problem of what our consciousness signifies or what its ideals should be. The things we perceive, he is fond of saying, merely 'exist' but are not 'real'. For this reason the real mental life—the life of will, of action, of valuation, of ideals—lies outside the province of psychology, which is ever busy with the beggarly elements of the mental life and never takes up the problems that interest us as active and moral beings—questions of deeper truth, of beauty, of conscience and religion. The scientific spirit is consequently something which stands in contrast with real life; it is no substitute for the moral and religious spirit.

At the same time Professor Münsterberg somewhat clouds this correct perception of his by putting the antithesis between facts and values too strongly. At times it looks almost as if each could get along without the other; as if a great gulf were fixed between them, so that the realm of ideas appears in almost Platonic isolation from the world of sense-perception. The 'world of values' and the 'world of facts' are of course not two worlds, but rather different ways of considering the self-same world. In Kantian phrase, we might say that facts without values are blind, while values without facts are empty. Professor Münsterberg shows, at least in one passage, that he himself takes this view; but a certain love of contrast and antithesis, too often makes him put the matter otherwise.

And in his endeavor to show the insufficiency of the psychological standpoint, the author really does injustice to psychology. He holds that psychology does, and must 'transform' the facts for purposes of explanation; and explanation, he believes, is possible only when we can restate the facts in terms of atoms or something else equally elementary. In psychology, consequently, everything must, by hook or crook, be analyzed into *sensations*, since these are the mental elements which correspond to the atoms of the physical world. Even when we distinctly know that the real mental process—an idea, an emotion, or act of will—is *not* completely described when we have enumerated the sensations that compose it, nevertheless (according to the author) the psychologist is by the logic of the situation forced to shut his eyes