mal, as with all gases, and all heat supplied is utilized as external work. The constant-quality curves have the equation $pv^{1.0568} = C$. With adiabatic expansion, the quality improves with all mixture in which $x < 0.6$ and the fluid progressively condenses for mixtures of initially $x = 0.7$ and above. The value of n is found to be

$$n = \left(\frac{x}{c}\right)^{\frac{1}{6.36}}; \; xn^{-6.36} = C;$$

the logarithmic curve is given, graphically illustrating the law of variation of n.

The specific volume of CS_2 is 2.6258 times that of air. Its boiling point is, according to Thorpe and Freidburg, 115.88 *F.* and its critical temperature is 504.5° *F.*, at a pressure of about 65 atmospheres.

The paper is one of special value and is the outcome, in part, of work for the Ph.D. at Cornell. R. H. T.

SOCIETIES AND ACADEMIES.

NEW YORK ACADEMY OF SCIENCES. SECTION OF BIOLOGY.

THE first meeting of the academic year was held at the American Museum of Natural History on October 12, Professor Wilson acting as temporary chairman. As in former years, this first meeting after the long vacation was devoted to reports on scientific work carried on by members of the section during the summer. The following notes indicate the lines of the work of the members who reported.

Professor Bristol, in association with Professor Mark, of Harvard, directed the summer work at the Bermuda Biological Station. Dr. Hay was very successful in collecting in Wyoming materials for his studies of fossil turtles. Professor Osborn directed explorations in Wyoming, Nebraska and South Dakota in the interest of the American Museum of Natural History, securing much valuable material which supplements collections previously made. Professor Grabau collected in Michigan materials for continuation of his studies on Devonian faunas. Dr. Summer directed the Biological Laboratory of the United States Fish Commission at Woods Hole, Mass. Professor Calkins studied the relation of Protozoa to cancer and smallpox. Professor Crampton continued the accumulation of data relating to selection in Lepidoptera. Mr. Bigelow studied the early embryology of some crustaceans. Mr. Yatsu experimented on regulation and organization of nemertean eggs. Professor Wilson at Naples studied problems of localization and mosaic development of molluscan eggs.

M. A. BIGELOW,
Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

AT the meeting of the section on October 5, Professor Harold Jacoby and Dr. S. Alfred Mitchell exhibited a combined prismatic transit and zenith telescope. This instrument, just received by the Department of Astronomy of Columbia University, was made by Bamberg of Berlin. It includes all the latest observational devices, including an eye-piece of the Repsold pattern for the automatic registration of transit observations.

Dr. George F. Kunz and Dr. Charles Baskerville gave an exhibition of radium of 300,000 activity, with some notes on the action of the Roentgen ray, ultra-violet light and radium on mineralogical substances. This paper will be published elsewhere in SCIENCE.

S. A. MITCHELL,
Secretary of Section.

DISCUSSION AND CORRESPONDENCE.

THE INTERNATIONAL CONGRESS OF ARTS AND SCIENCE.

TO THE EDITOR OF SCIENCE: I returned only a few days ago from Europe and, therefore, have not seen until now the letter of Professor Dewey in SCIENCE of August 28 and that of Professor Woodward in SCIENCE of September 4, both of which deal with the International Congress of Arts and Science and especially with my essay on that congress, published in the May number of the *Atlantic Monthly.*

Professor Woodward's document gives me hardly a chance for a reply, since I can not see that it contains an argument. It is only a general expression of his contempt, on principle, for every effort to classify sciences from

a logical point of view. "While we may not go out of our way," he says, "to oppose philosophers and literary folk who indulge in such extravagances, it is our duty to repudiate them when they appear in the public press in the guise of science; for they tend only to make science and scientific men ridiculous." It may appear surprising if my chief aim was to make science ridiculous for the amusement of literary folk, that I took my medical degrees and have since been conducting scientific laboratories. But the worst of it is that those 'philosophers and literary folk' who have indulged in the acceptance of a program 'which bordered on absurdity' are the president of the congress, Professor Simon Newcomb, Mr. Pritchett, the president of the Massachusetts Institute of Technology, and others who were up to this time believed to have a certain interest in 'science'—for Professor Woodward is mistaken if he doubts that the program and classification which he saw has the endorsement of the entire committee. But the kind criticism of Professor Woodward requires the less discussion as he is also mistaken in his second presupposition. He thinks that the classification of sciences which has been accepted for the International Congress was sketched in my article for the purpose of inviting criticism of the scheme. That was not the case. It was merely a communication concerning a settled arrangement, fully discussed and definitely voted by the proper authorities. If I had been longing for criticism, I should hardly have published it in a form which offers merely results and not reasons; and however 'absurd and ridiculous' my system may be, I have at least never evaded the duty to give the reasons and arguments for my positions. A 'scientific man' can not of course read what philosophers and literary folk are writing; otherwise, I might refer him to the first volume of my 'Grundzuege der Psychologie,' in which about 500 pages are devoted to just this discussion; perhaps also to a short essay in the first volume of the 'Harvard Psychological Studies' (Macmillans), where he might find a large map with a tabular view of such classification. There is no doubt that it is more comfortable to 'repudiate' such 'extravagances' than to argue about them; but is it really more 'scientific'?

It is quite different with the very interesting letter from Professor Dewey of Chicago. His letter is full of important arguments worthy of serious consideration. He points clearly to certain dangers in the scheme, and the question is only whether those disadvantages ought not to be accepted in order to gain certain advantages which strongly outweigh them. Every one of the points he raises has been indeed matter for long discussion in the committees, and only after conscientious deliberation have we come to the decisions which he regrets.

As I tried to bring out in my *Atlantic Monthly* article, our real aim is to have a congress which has a definite task and which does not simply do the same kind of work that men of science are attempting every day and everywhere. We do not want, therefore, a bunch of disconnected congresses and in each one a bundle of disconnected papers which could just as well have appeared in the next number of the scientific magazines. We want to use this one great opportunity to work, in a time of scattered specialization, towards the unity of thought. We want to bring out the interrelations of all knowledge and to consider the fundamental principles which bind the sciences together. We want to create thus a holiday hour for science, with a purpose different from that of its workaday functions, an hour of reposeful self-reflection. Therefore, not everybody who would like to be heard could be admitted to the platform, but only those who are leaders in their field, and even these may not speak on their chance researches of the last week, but on definite subjects which all together form one systematic whole. Such a monumental work could be created only under the exceptional conditions of a congress embracing all sciences and all countries, and important enough to attract those who are masters in their work with a wide perspective. This was our aim and this alone our chief claim, as I tried to bring out in my essay, and I see with great satisfaction that Professor Dewey feels in full

harmony with this essential part of the undertaking.

The aspect which he dislikes is this: If we are to invite the leaders of all special sciences, each to consider the relations of his science to the other departments of knowledge, then we must clearly chop the one totality of knowledge into many special parts. That involves at once certain principles of division about which different opinions may exist. We have agreed to recognize 25 different departments with 134 sections, and such decision involves, of course, at once a certain grouping. The sections of the same department stand nearer together than the sections of different departments, and some of those departments again stand in close relations and thus form larger units. We grouped our 25 departments into 7 such chief divisions. Now Professor Dewey says we had no right to do all this, because our classification partly anticipates the work which is to be done by those who are to give the addresses. If each department has from the beginning a definite place on the program, its relations to all other sciences are determined beforehand and it has become superfluous to call in the scholars of the world simply to concur in the committee's ideas concerning the system of knowledge.

But I might ask, what else ought we to have done? I know very well that instead of the 134 sections, we might have been satisfied with half that number or might have indulged in double that number. But whatever number we might have agreed on, it would have remained open to the reproach that our decision was arbitrary, and yet we did not see a plan which allowed us to invite the speakers without defining beforehand the sectional field which each was to represent. A certain courage of opinion was then necessary and a certain adjustment to external conditions was unavoidable; in every case we consulted a large number of specialists. Quite similar is the question of classification. Just as we had to take the responsibility for the staking out of every section, we had also to decide in favor of a certain grouping if we desired to organize the congress and not simply to bring out a helter-skelter performance. Professor Dewey says: "The essential trait of the scientific life of to-day is its live-and-let-live character." I agree with that fully. In the regular work in our libraries and laboratories the year round everything depends upon this democratic freedom in which every one goes his own way, never asking what his neighbor is doing. It is that which has made the specialistic sciences of our day as strong as they are. But it has brought about at the same time this extreme tendency to disconnected specialization with its discouraging lack of unity; this heaping up of information without an ordered and harmonious view of the world; and if we are going to do what we aim at, if we want really to satisfy, at least once, the desire for unity, the longing for coordinations, then the hour has come in which we must not yield to this live-and-let-live tendency. It would mean to give up this ideal if we were to start at once without any principle of organization, ordering the sciences according to the alphabet, perhaps, instead of according to logic. The principles which are sufficient for a directory would undermine from the first the monument of scientific thought which we hope to see erected through the cooperation of the leaders of science. Therefore, some principle had to be accepted. And just as with number of sections, it may be said here too, that whatever principle could have been chosen would probably have had its defects and would certainly have been open to the criticism that it was a product of individual arbitrary decision.

A classification which in itself expresses all the practical relations in which sciences stand to each other is of course absolutely impossible. Professor Dewey's own science, psychology, has relations to philosophy, relations to physiology, and thus to medicine, relations to education and sociology, relations to history and language, relations to religion and law. A program which should try to arrange the place of psychology in the classified list in a way that psychology should become the neighbor of all these other sciences is unthinkable. On the other hand, only if we had tried to construct a scheme of such ex-

aggerated ambitions, should we have been really guilty of anticipating a part of that which our speakers are to tell us. We leave it to the invited scholar to discuss the totality of relations which practically must exist between psychology and other departments of knowledge. We confine ourselves to that minimum of classification which indicates the pure logical relation of the science in the sense of subordination and coordination, that minimum which every editor of an encyclopædic work would be asked to indicate without awakening suspicion of interference with the ideas of his contributors.

The only justified demand which could be made was that we choose a system of division and classification which should give fair play to every existing scientific tendency. And here alone came in the claim which I made for that scheme which has been accepted for the congress. I believed that our classification, more fully than any other, would leave room for every wholesome tendency of our times. I showed that a materialistic system would give fair opportunity to the natural sciences but not to the mental sciences; that a positivistic system would offer room for both mental and natural sciences; but that only an idealistic system has room for all; for the naturalistic and mental sciences, and also for those tendencies which are aiming at an interpretative as well as a descriptive account of civilization. And while we are trying to get, as I said, an organization with a minimum of classification, we were thus trying to provide at the same time for a maximum of freedom. Whatever other principles of classification we might have chosen would have led to an arbitrary suppression of some existing tendencies in modern thought. To use Professor Dewey's illustration: Those students of art, history, politics and education who treat them as systems of phenomena and those who treat them as systems of purposes, alike find in different sections their full opportunity. I have a slight impression that Professor Dewey would have preferred a classification which would have room only for one of the two groups. Our congress will be less partial than our critics. We shall have place and freedom for all.

But there is no reason to speak to-day, as I had to do in May, of a plan for the future. Our undertaking has already a little history. The program has been tried. Then was the moment for the appearance of those destructive effects which Professor Dewey feared. Professor Newcomb, Professor Small and I, who have been honored by the invitation to work as an organizing committee, have just returned from Europe, where we were to bring personal invitations to those who had been selected for the chief addresses. Professors Newcomb and Small visited France, England, Austria, Italy and Russia. I had to see the scholars of Germany and Switzerland. As the Germans have the reputation of being the most obstinate in their scientific ideas, their attitude towards the presented program may be considered as the severest test of it. I had to approach 98 scholars in Germany. Every one saw the full program with the ominous classification of science before he made his decision. Only one third of those whom I invited felt obliged to decline, and among them was not a single one who refused to come on account of the objections foreshadowed by Profesor Dewey. Some can not come because of ill health, some because of public engagements, some on account of the expense, and some because they are afraid of sea-sickness, but not a single one gave the slightest hint that he was disturbed by the limitations which the program might put on him. On the other hand, among those two thirds whom we hope to see here next September, very many expressed their deep sympathy with the plans and the program, and not a few insisted that it was just this which tempted them to risk the cumbersome voyage, while they would have disliked to participate in a routine congress without connected plan and program.

Of course that would not count for much in the minds of my critics, if those who have promised to come and deliver addresses under the conditions of our program were merely 'literary folk who indulge in such extravagances.' I may pick out some of the German

names. For human anatomy there comes Waldeyer of Berlin; for comparative anatomy, Fuerbringer of Heidelberg; for embryology, Hertwig of Berlin; for physiology, Engelmann of Berlin; for neurology, Erb of Heidelberg; for pathology, Marchand of Leipzig; for pathological anatomy, Orth of Berlin; for biology, Weismann of Freiburg; for botany, Goebel of Munich; for mineralogy, Zirkel of Leipzig; for geography, Gerland of Strassburg; for physical chemistry, Van't Hoff of Berlin; for physiological chemistry, Kossel of Heidelberg; for geophysics, Weichert of Göttingen; for mechanical engineering, Riedler of Berlin; for chemical technology, Witt of Berlin, and so on. Or to turn to the department of Professor Dewey: For history of philosophy, Windelband of Heidelberg; for logic, Riehl of Halle; for philosophy of nature, Ostwald of Leipzig; for methodology of science, Erdmann of Bonn; for æsthetics, Lipps of Munich; for psychology, Ebbinghaus of Breslau; for sociology, Toennies of Kiel; for social psychology, Simmel of Berlin; for ethnology, von den Steinen of Berlin; for pedagogy, Ziegler of Strassburg. Or to mention some other departments: Among the philologists I notice Brugman of Leipzig, Paul of Munich, Delitzsch of Berlin; Sievers of Leipzig, Kluge of Freiburg, Muncker of Munich; Oldenberg of Kiel and others. Among the economists, Schmoller of Berlin, Weber of Heidelberg, Stieda of Leipzig, Conrad of Halle, Sombart of Breslau, Wagner of Berlin. Among the jurists, Binding of Leipzig, Zorn of Bonn, Jellineck of Heidelberg, von Lizst of Berlin, Wach of Leipzig, von Bar of Göttingen, Kahl of Berlin, Zitelmann of Bonn, and so on. Among the theologians, Harnack of Berlin, Budde of Marburg, Pfleiderer of Berlin. For classical art, Furtwaengler of Munich; for modern art, Muther of Breslau; for mediæval history, Lamprecht of Leipzig. Enough of the enumeration. The list from England and from France is on the same level, and I anticipate that when we soon shall send out invitations to several hundred Americans for definite addresses, their response will not be less general, their list not less noble. But American participation is a question of the future. The list of acceptances which I have given here stands as a matter of fact beyond discussion. Is there really any doubt still possible that we have secured on the basis of that disastrous program the greatest combination of leaders of thought which has ever been brought together? When we three came home from our European mission after four months of hard labor to secure this result surpassing our own expectations, we might have felt justified in the hope that scientific men of this country would welcome us otherwise than with the cry that we, under the guise of science, have made science ridiculous.

HUGO MÜNSTERBERG.

HARVARD UNIVERSITY,
October 12, 1903.

SHORTER ARTICLES.

A PLEA FOR BETTER ENGLISH IN SCIENCE.

THAT to genuine scholarship is not always conjoined power of expression is common knowledge. Not a few men who have received academic training and have been honored with university degrees, who have explored profound mysteries of nature and discovered hidden laws, seem to be incapable of clearly explaining the processes they employ in their researches or of plainly setting forth their discoveries.

Not long ago a contributor to *The Critic* said:

> The development of scientific method is alleged to be one of the foremost characteristics of the present century. Philologists will ransack the earth, if not the heavens, for exact information as to date and authorship of even the fragments of ancient literature; botanists will tramp the forests for months to verify or disprove the rumor of a new orchid, and astronomers will go to any accessible point on the face of the globe for more exact figures on an eclipse or a transit of Venus. We might expect, then, to find a corresponding effort for exactness in the expression of thought, but an examination of the evidence is not altogether encouraging.

A few months ago a Boston editor published the following paragraph:

> The English language is suffering violence in many ways. Among those who are forgetting its