

actual beginning. Portraits of its early members were exhibited and brief biographical sketches presented. Out of the activity of the club and of the botanical department of Columbia, grew the demand for a great botanical garden, which was satisfied by the establishment of the present New York Botanical Garden. The contemporary botanical forces at work in the city were briefly described, and their most important present needs outlined. The complete address was published in *Torrey* for June and July, and separates will be furnished at ten cents each.

The lecture was followed by an informal reception in the library, and by an inspection of the library, laboratories, herbaria and the museum exhibits.

C. STUART GAGER,
Secretary.

DISCUSSION AND CORRESPONDENCE.

THE POLICY OF THE U. S. GEOLOGICAL SURVEY AND ITS BEARING UPON SCIENCE AND EDUCATION.

TO THE EDITOR OF SCIENCE: It is but fair to Director Walcott that his reply to my letter insisting upon my resignation should be laid before those who have seen the earlier letters. The following is a copy of it:

U. S. GEOLOGICAL SURVEY,
WASHINGTON, D. C., Nov. 9, 1906.
DR. J. C. BRANNER,
STANFORD UNIVERSITY, CALIFORNIA.

Dear Sir: Your letter of October 13 was received at this office on October 22, and in my absence was acknowledged by Dr. Hayes on October 23. I was naturally surprised on my return to find that this letter, together with other correspondence on the subject of surveys in the Arkansas coal field, had been published in SCIENCE on October 26. I am at a loss to understand your reasons for publishing the correspondence, inasmuch as I do not think anything is to be gained by a public controversy. I have sent a brief communication to SCIENCE (copy enclosed) explaining the principles which govern the United States Geological Survey in its relations with other geological surveys and working geologists.

In your letter, on page 2, you state seven reasons, deduced from my letter of March 8, for the course followed in this matter, and reply to them. Permit me to add a word of comment to your replies.

1. "The field work on the Arkansas coal region was done 18 years ago." You recognize that work done so long ago needs to be brought up to date before publication. Your contention is that, "having originated and directed the survey of the Arkansas coal fields," you should be allowed to bring the work and the report up to date. This, of course, is the gist of the whole matter, and I shall revert to it again.

2. "It was based upon poor maps." There is no difference of opinion on this point. Inasmuch, however, as the scale of publication proposed by this Survey is only half that insisted upon by yourself, and as the map will be published without contours, the defects in the topographic base are very much less serious than they would have been if your proposition had been accepted and an attempt had been made to publish maps on the 62,500 scale.

3. "The work is not 'up to present standards' and therefore could not be accepted for publication by the Survey." You state that "neither you nor any of your assistants have read the report and you can not therefore know anything about its relations to standards of any kind." While the report has not been read, you will recall that the maps were examined in December, 1901, by Dr. Hayes in connection with the proposition to publish the report at that time. These maps bore such evidence of inaccuracy and generalization that the scale proposed for their publication was not regarded as suitable and the recommendation was made that they should be reduced, preferably to one-quarter, and at least to one-half, the scale proposed. He made no statement regarding the standard of the written report, but considered the maps as amply justifying the statements made regarding the character of the work. You will recall that in the correspondence of 1901, when the proposition to publish your report was being considered, an essential condition to such publication was that additional field work should

be done by some member of this survey, Messrs. Taff and Adams being mentioned in this connection. You are mistaken, therefore, in supposing that there was any intention on the part of this survey to accept your report without thorough examination and additional field work.

4. "New uses for the coals have been found by the fuel testing plant of the survey." This has little bearing on the subject except that it increases the urgency for information regarding this coal field.

5. "Losses have been caused by errors in the map of the Arkansas coal field for which I am responsible." This is based upon very definite and emphatic statements made by large coal operators in the Arkansas field. They have stated that on the basis of the map published in the twenty-second annual extensive holdings were transferred from one region to another and on testing it was discovered that productive had been exchanged for unproductive territory. It was on account of the representations of these coal operators, and their urgent requests, that the work was undertaken in Arkansas, and not through the recommendation of any member of Congress.

6. "The salaries of regular assistants of the survey being provided for, work must be given them." Three geologists whose salaries had been provided for to the end of the year had completed their office work and were available for field assignment. If the money asked for the payment of yourself and assistants for the Arkansas work had been allotted, it would have been impossible to send these men into the field and they would practically have remained idle until the new appropriations became available.

7. You say "I was anxious to obtain your unpublished data, for which ample payment would have been made and full credit given." In reply to this you say "the reports of the Arkansas Geological Survey not being my personal property, I leave others to characterize your proposition to pay me for one of them." You imply in this statement that something dishonorable was contemplated in the transaction. I must remind you that on July 9, 1901, a check for \$200 was sent to you

in payment for a report on the clays of Arkansas, which presumably was as much the property of the state as the coal report. It was distinctly stated at that time that this payment was "for the necessary office work required to put your reports into shape for publication." The "adequate payment" for your coal report would have been for precisely the same purpose. If you had felt that you were not entitled to the payment, it would have been a simple matter to turn it over to the state of Arkansas.

As distinctly stated, I desired to obtain your report in order, first, that the results of your work might not be entirely wasted, and, second, that you might receive the credit to which you would have been justly entitled. However inadequate a report on the geology of a region may be, and whatever errors it may contain, it is of some benefit to another geologist who is taking up the study of the region, and I considered that a reasonable expenditure would be justified because of the benefit your report would be to a geologist entering the field.

I am quite willing to accept your statement of the seven reasons for my action which you have deduced from my letter of March 8. These reasons are all good and were regarded as fully justifying the course pursued. You are correct further in your conclusion that there are other reasons which it was not considered necessary to state in my former letters. In that correspondence I ought, perhaps, to have been less careful of your feelings. The additional reasons which had weight in the matter are as follows:

1. It was extremely desirable that the report on the Arkansas coal field should be issued at the earliest date possible. This was made a point of special urgency in the requests received from those most directly interested in the field. In order to secure this result it was deemed essential that the work should be done by regular members of the survey, who should bring their results to Washington and work them up here. I need only refer to the experience of the survey with your own reports to indicate the grounds for fearing that if the work were turned over to you prompt-

ness in publication would be impossible. The clay report above mentioned was paid for on July 9, 1901. The manuscript was received, after several urgent requests, at the end of March, 1904. The manuscript for the Santa Cruz folio was promised for July, 1903. It was received March 17, 1906.

2. An examination of your preliminary coal report published by the Arkansas Survey, together with the map furnished Mr. Taff for publication in the Twenty-second Annual, in the light of subsequent work on the coal measures in the region immediately adjacent in Indian Territory, led the geologists familiar with the matter to the conclusion that you had made serious errors in correlation and in the interpretation of structure in the Arkansas field. It was believed that these errors might very easily be perpetuated if the resurvey of the field should be made by yourself—that you would be handicapped by your belief in the correctness of your former conclusions, and hence that better results would be secured if the work were done by some one entirely free from preconceptions as to stratigraphy and structure.

3. During the last ten years much attention has been paid by this survey to the examination of coal fields in various parts of the country. A body of experts has been developed whose experience is probably not anywhere surpassed. On the other hand, so far as I am aware, you have, since leaving Arkansas, devoted little if any attention to the investigation of coal fields; also those whom you would probably secure for assistants in the work, with the possible exception of Dr. Newsum, would have had little if any experience in this kind of work. In this age of specialization it will, I think be conceded by all that even the examination of a coal field can be done more efficiently by coal experts than by those whose training has been in other lines of geology.

Concerning the last three pages of your letter I shall make very brief comment. The relations of this survey with existing state surveys are uniformly cordial. Every effort is made to strengthen state surveys and to

cooperate with them in such a way as to render their usually limited resources most productive of good to the people of the state. Cooperation is never forced upon a state organization, and extreme care is exercised to prevent duplication by this survey of any work being carried on by any state organization. As to the invasion of fields occupied by professors of geology, there are in the files of the survey many letters to such professors urging them to work up the local geology and offering financial assistance and means of publication of their results. The case of the Fayetteville quadrangle is perhaps an apparent exception. It should be stated, however, that when the work was undertaken there Professor Purdue was practically unknown as a geologist and was, as a matter of fact, not sufficiently experienced to carry on independent work. Since his season with Adams he has been employed each summer and has submitted three folios for publication. It has been necessary, however, in connection with this work, to send more experienced men into the field with him, although he will receive the entire credit for the work.

The right of any geologist to restrict the field of operations of this survey in opposition to the public interests can not be admitted. Where work is being done by a private geologist or an institution or an organization, or where the work has been done, and there is prospect that the results will be published, it is manifestly contrary to good policy for another organization to enter the field and do the same work over again. The survey has scrupulously refrained from such invasion of an already occupied field. The fact that a field has been occupied does not, however, give exclusive rights to the first occupant indefinitely if there is no prospect that the results will ever be published. Eighteen years is sufficient time in which to secure publication of results, and in this case the interests of the public far outweigh any private interests you may have retained in the field.

Your letter of February 26, 1906, tendering your resignation as geologist in the United States Geological Survey has been forwarded

to the Secretary of the Interior with recommendation that the same be accepted.

Very respectfully,
CHAS. D. WALCOTT,
Director.

Some of the points mentioned in this and in the letter to the editor of SCIENCE, especially those relating to maps, scales, qualifications, errors both topographic and geologic, may be left to one side as being of little importance in this connection, though I should not hesitate for a moment to submit my own case on every count mentioned to any jury of scientific men. It is quite evident to any unbiased geologist that the reasons put forward for the survey's invading my field are mere subterfuges for an inexcusable course of conduct.

• It is worth while, however, to note certain points in passing. Mr. Walcott does 'not think anything is to be gained by a public controversy.' Perhaps not; but it is certain that nothing is to be gained by an appeal to courtesy or by a private controversy with a public bureau that has the whip-hand of every working geologist in this country. And neither is anything to be gained by a cringing submission to such a bureau. This is a matter of public concern, and so long as one gets no hearing in private he has no remedy but to bring the subject to the attention of the public.

To the charge of making mistakes my reply is that I have made them and do make them.

Mr. Walcott says: "It appears from Dr. Branner's latest letter that he still regards the survey of a coal field worth many millions of dollars and capable of serving several millions of people as his own personal affair. This bureau is directed on broader lines." This is merely a bit of political dust, and the broad lines on which he directs the survey do not appear to preclude the use of such materials. I regard the work on the area concerned as my own personal affair just so far as the work done on it entitled me to finish it and no further.

Leaving these minor matters, attention is asked to four propositions that vitally concern

scientific work and scientific education in this country as affected by the attitude of the U. S. Geological Survey toward state surveys and towards the geologists of the country not regularly employed on the survey.

First, it is maintained that the U. S. Geological Survey can and does encroach upon fields that, by the rules of equity and common courtesy, belong to state surveys and to local individual workers in geology.

Mr. Walcott meets the first proposition squarely in his letter to me. The italics are mine. He says: "*The relations of this survey with existing state surveys are uniformly cordial. * * * Cooperation is never forced upon a state organization, and extreme care is exercised to prevent duplication by this survey of any work being carried on by any state organization.*" Near the end of his letter to me he says: "*The survey has scrupulously refrained from such invasion of an already occupied field.*"

My own experience as state geologist of Arkansas is far from bearing out these statements; but as the survey of which I had charge is no longer in existence, and as he seems to wish to confine the question to those that have not yet been killed, let us take one that has managed to survive. One of the state geologists writes me under date of October 29, 1906, as follows: "*My own experience officially has been as bitter and wholly unjustifiable as yours.* By repeated and vigorous personal appeal * * * and only by resort to * * * our representatives in congress have I been able to save this * * * state survey from a most humiliating exigency. Indeed I have not wholly succeeded, and am grimly conscious to-day that though I have dislodged the U. S. Geological Survey corps from most all parts of the state, *its representatives have held on to one region where we were busily engaged at the time of their arrival, and ignoring entirely all our work, have carried their humiliating procedure to a finish.* We have spent some thousands of dollars in correcting the unskilful and erroneous work of these gentry. * * * To tell our experience would be a long story, perhaps bootless to rehearse, but I join with you and many others

in deprecating the present policy of the survey in the matter of intrusion upon states to the great discredit of the state organizations and the individual geologists."

And this Mr. Walcott calls 'uniformly cordial' relations, 'strengthening and cooperating with the state surveys,' and 'scrupulously refraining from invasion of an already occupied field'!

But whether the relations of the state surveys to the national survey are cordial or not (and I am far from doubting that *some of the state surveys know that unless they keep up the appearance of cordiality they will soon cease to exist*), I assert, without the slightest fear of successful contradiction, that there is not a single state geologist in this country to-day who does not know that his work, his field of operations, his livelihood, and his very reputation are wholly at the mercy of the national survey. And I ask any person who has the blood of a free man in his veins if this is not an intolerable state of affairs.

Mr. Walcott says that 'cooperation is never forced' on a state survey. I beg to refresh his memory with the fact that when a bill providing for a state geological survey was lately before a certain state legislature, he himself wrote to prominent members of the legislature advising that unless cooperation with the U. S. Geological Survey was provided for, the bill should not pass. If that is not forcing cooperation on a state then I fail to understand the English language.

So far as individuals are concerned the survey seldom takes them into consideration save when they do something or turn up something that is likely to serve the purposes of the survey. If the individual undertakes any special bit of work, whether in field or laboratory, the survey is in position to invade his territory, to drive him out of it, and to discredit him. Is it not a most humiliating fact that scientific men, in this the twentieth century, should be compelled by a federal bureau to hide themselves like whipped curs to gnaw their small bones in obscure corners? For if an investigator does not keep quiet about his work he knows perfectly well that, upon one pretext or another, he is likely to be pounced down upon

and his work taken out of his hands—and 'due credit given,' of course! It is all very well for the director of the survey to say that he had no intention of doing such things. He has the power to do them and he does them.

The second proposition is that the national survey has discredited and enfeebled the state surveys, and that it prevents their normal growth even when it does not entirely drive them out of existence.

The truth of this statement is so self-evident that it hardly admits of discussion. The cases quoted above are proof enough, and instances more or less similar can be found in almost every state where state surveys still exist, and in other states where the surveys have been killed off through the influence, direct or indirect, of the national survey. This is the more important because the state surveys are vastly more useful to the states and to state industries than is the national survey. The state surveys, however small they may be, are in touch with the people, keep alive an active local interest in geology, and serve as a valuable training school for young geologists. And this widespread interest in science is not only important, but above all is it important that the people of this country be left to manage their own home affairs even though they may not manage them so well, rather than to have them directed by a bureau at Washington, run as a great scientific trust and paid for at the rate of millions of dollars a year out of the public funds.

It is no part of the functions of a national government to interfere with and to discredit state and other local governments, and just as little should it be a function of any national scientific bureau to weaken, patronize, or in any way discredit state and other local scientific work.

The third proposition is that a systematic effort is being made by the present director to deprive university professors of the support of the national survey to carry on work that falls or should fall naturally to them.

It is a matter of common knowledge that many of the professors of geology over the

country have received from the U. S. Geological Survey small allotments of money that enabled them to spend their holidays and odd hours in doing geologic work in which they were especially interested. This work has yielded excellent and far-reaching results both for the national survey and locally. It has greatly encouraged the younger geologists, for it has generally been regarded as a sort of official recognition of their professional ability and standing, it has enabled them to widen their knowledge and experience, and not infrequently it has enabled the poorly-paid teachers to keep their heads above water financially. This policy has justly strengthened the survey throughout the country. The survey seems to feel, however, that it has now outgrown the necessity of this kind of support, and the time has come when these professors are to be dropped as rapidly as it can be done without precipitating matters. The director probably realizes at the same time that, as long as the names of these professors are on the payroll of the survey, they are not going to quarrel with their bread and butter. The professors must face the situation whether they wish to do so or not, for here is the policy set down in black and white:

Mr. Walcott says in his letter given above that the professors "can not work as efficiently for the national survey as can the geologists constantly in its employ, and recognition of this fact has led in recent years to a reduction of the proportional amount of work allotted to teachers of geology, who can give but a share of their time to it." This statement of the case is straightforward and the question is well defined. Even if it were not so clearly put, the course of the survey during several years past made this plan apparent. Mr. Walcott's policy has lately made itself quite apparent also in the conduct of the Carnegie Institution of which he was for several years the secretary, and of whose executive committee he is still a member.

This plan on the face of it seems reasonable. It is to be noted that there is no complaint of the grade or character of the work done by the professors, it is simply that they can not give their entire time to it, and that they are

therefore and necessarily slow in handing in results.

The fourth proposition is that such a system of discrimination by a national bureau against the scientific work of university professors discredits scientific instruction in the universities, and must inevitably react against the men who devote themselves to scientific work and study, against the dignity and usefulness of the teacher's vocation, against the high character and efficiency of scientific instruction in our institutions of learning, and eventually against science itself.

Science in this country has come chiefly from the educational institutions. It is in them that standards are set and maintained, and it is from them that the most incisive scientific thought has come. If the professors have been slow, they have also been painstaking and trustworthy. They have worked at science because they loved it, and their deep interest in their work and their unselfish and often fatal devotion to it has been a constant inspiration to their students, and a source of strength to the institutions with which they have been connected. Unfortunately, these professors have small salaries and they have little or no money with which to carry on their researches or original work, and even the little they have often comes out of their own slender private funds. There is another reason for this slowness of the professor that is not likely to appeal to the director of the survey: I refer to the fact that the amount of money allotted to the work to be done by a professor in the survey's employ is sometimes so small that he is unable to finish a given piece of work within a specified time and to do it as he thinks it should be done. In his letter of November 9 my own case is cited in evidence of the delay of the professors in handing in their results. The allotments made for the work mentioned (the Santa Cruz quadrangle) were so small that in order to do the work properly I was obliged to spend about a thousand dollars of my own money. Dr. Newsom, who joined me in this work, likewise paid out about seven hundred dollars to help put the work in better shape. Dr. Newsom's bill was finally presented to the survey and

was paid; I have never asked for reimbursement. This case is not mentioned for the purpose of excusing my own delay, but as affording an explanation of why university professors are sometimes slow, and to suggest at the same time that slowness may not be quite as bad as haste when that haste brings forth slipshod results.

Here again the slowness of the professors is liable at any moment to be made an excuse for invading our fields of operations. Thus the whole tendency of the survey's policy of haste is towards more haste and poorer work.

I acquit Mr. Walcott of any intention to discredit professors by his policy. With his intentions, however, we have nothing to do; it is with his methods and results that we are concerned. We can not discredit the source of instruction and keep the instruction efficient. This wholesale discrimination against the universities can have no other results than those mentioned: discredit to the professors, eventual loss of efficiency and a corresponding reaction upon the universities and upon science.

Finally, if this policy were confined to the geological survey proper there would be less to fear from it. But unfortunately the geological survey has expanded far beyond the legitimate fields of geologic work. Forestry, irrigation, water-supply, reclamation and engineering have been added to its functions, and it has occasionally looked longingly toward the Coast and Geodetic Survey, and I know not what more besides. This expansion, under Mr. Walcott's policy, simply increases the field of its possible powers of demoralization for education and science.

Furthermore, this same policy is already being put into active operation in the Carnegie Institution, and Mr. Walcott is now a candidate for the position of secretary of the Smithsonian Institution, where he could be counted upon to put it in still further practise. With a great overgrown national bureau already committed to this policy and with these two endowed institutions of research under similar control, the university professors of the sciences in this country and the universi-

ties themselves are face to face with a serious problem.

In connection with this question I have frequently been reminded that the geological survey has come to be a great scientific trust; that trusts and trust methods are in the air, and that there is little hope of success in fighting them, especially in view of the support commanded by the millions of dollars they receive every year. Very true; but there is also in this same air protest, rebellion and resentment against these high-handed methods, and especially so when they are paid for out of the national treasury.

J. C. BRANNER.

STANFORD UNIVERSITY, CALIFORNIA,
November 22, 1906.

EVOLUTION (COOK) AND MUTATION (WAAGEN).

Dr. O. F. Cook recently has published¹ a reply to my criticism of his views published some time ago,² but it only evades the main point at issue, and introduces, in its stead, a new topic, which had not entered the discussion before.

While I practically said, with reference to a previous article of Dr. Cook's,³ that his distinction between 'evolution' and 'speciation,' although correct, is not new, and objected to the term 'evolution,' he meets this with the rejoinder, that there is a distinction between 'heterism' and 'evolution'; and since he regards this distinction as new, as a progress in science, he claims the right to use the old term evolution in a new, restricted sense.

However, also this new point in the discussion does not justify Dr. Cook, for it is *not new to science*. 'Evolution,' as he understands it, has been often classed with 'variation,' as I have also done in my previous article. Nevertheless, as Dr. Cook maintains, there is a distinction between 'evolution,' the 'progressive transformation of species' in time, and 'heterism' (or variation proper) of coexisting individuals. But in this sense 'evolution' is absolutely identical with

¹ SCIENCE, September 7, 1906, p. 303.

² SCIENCE, April 27, 1906, p. 667.

³ SCIENCE, March 30, 1906, p. 506.