

SCIENCE

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CONTENTS

<i>The New Purpose in State Development; the Safeguarding its Own Future:</i> DR. JOSEPH A. HOLMES	65
<i>Charles Fay Wheeler:</i> W. F. WIGHT	72
<i>American Mathematical Publications:</i> PROFESSOR G. A. MILLER	75
<i>Home Economics</i>	76
<i>Mathematics for Admission to College</i>	76
<i>Scientific Notes and News</i>	77
<i>University and Educational News</i>	80
<i>Discussion and Correspondence:—</i>	
<i>The Apparent Sinking of Ice in Lakes:</i> PROFESSOR E. A. BIRGE. <i>The Effects of Deforestation in New England:</i> DR. HERDMAN F. CLELAND	81
<i>Quotations:—</i>	
<i>The Fight on the Colleges; The Organization of Ill-health</i>	83
<i>Scientific Books:—</i>	
<i>L'Année psychologique:</i> PROFESSOR E. B. DELABARRE. <i>The Conquest of Disease through Animal Experimentation:</i> PROFESSOR S. J. HOLMES	85
<i>Scientific Journals and Articles</i>	92
<i>Special Articles:—</i>	
<i>On the General Use of the Grating with the Interferometer:</i> PROFESSOR CARL BARUS. <i>Notes on an Experiment concerning the Nature of Unit Characters:</i> PROFESSOR E. M. EAST. <i>Trough Faulting in the Southern Adirondacks:</i> DR. W. J. MILLER	92

THE NEW PURPOSE IN STATE DEVELOPMENT: THE SAFEGUARDING ITS OWN FUTURE¹

THE STATE GEOLOGIST AND HIS WORK IN ALABAMA

FROM time to time as I have examined one after another of the valuable series of Dr. Eugene Allen Smith's reports on the geology and resources of Alabama, I have wondered when the people of this good state would come to a full realization of the value of his work, and would show their appreciation of it in some tangible form. For he has labored faithfully and successfully in behalf of his native state. Too often it is true that geologists as well as prophets are not without honor save in their own country. I am pleased to-day to find that this is not true in Alabama; and I am more than pleased to be permitted to take part in the opening ceremonies of this splendid building, which stands as a testimonial of your appreciation of a good work well done.

And one of the best features of the occasion is the fact that this good work is still in progress. I am glad that the people of Alabama did not follow the common practise and wait until after Dr. Smith was dead, to do him and themselves honor. I rejoice with you that we are here to-day, not at a funeral service, but to do honor to and enjoy with this good man himself the recognition of not only what he has

¹Address on the occasion of the opening of Smith Hall, housing the State Geological Survey and its collections, and the geological department of the State University, at Tuscaloosa, Ala., May 30, 1910.

done, but what he is doing, and of what he is yet to do.

Dr. Smith doubtless came into the world without his knowledge or approval; he has labored in behalf of this state and this university long and well; in due course of time he will go out of the world without his consent; for I am sure he would like to work on forever in the upbuilding of his beloved Alabama.

And if I may give to the university trustees and your state legislature one piece of good advice, it is this: During Dr. Smith's remaining years give him all the money and all the help he can use in this work. You may rest assured that with his present extensive knowledge and experience as a basis, for every dollar you now invest the state will reap a hundredfold in return.

This important work in Alabama Dr. Smith was no doubt already planning at the time of his graduation from this institution as far back as 1862, and during his subsequent studies at Heidelberg and Göttingen and Berlin. His plans were no doubt being matured when he entered the university as a member of its faculty in 1871, because shortly thereafter, in 1873, he organized the State Geological Survey on which he has served continuously to the present time.

In the discharge of these double duties, his devotion to his native state has prevented his accepting more remunerative employment elsewhere, and has kept him hard and continuously at work during the past three decades. He holds the record among living state geologists for long and faithful service in behalf of a single state. And it is a record to be proud of; for among the state geologists in the United States, during the past half century, there have been many able, useful and devoted men, who have contributed largely not only to the science of geology, but to the wise de-

velopment of the states they have served.

Dr. Smith's services in Alabama have witnessed, have been a part of, and have contributed to the growth of more rational plans looking to the future as well as the present welfare in the development of the state; and this phase of his work is worthy of our special attention on this occasion.

He has also stood for and has been a part of the wise state policy of connecting with its university instruction other departments of the state's activity, such as a geological survey. In this dual capacity, as university professor and state geologist, he has not only done much toward the intellectual training of the young men who safeguard the interests of the state in every phase of its life and work, but he has taught these young men to know their state; so that in their subsequent careers as legislators and teachers, and men following other vocations, they have been able to contribute toward her wiser growth, both in material and intellectual affairs. They are thus preparing not only a good foundation, but also a good superstructure, for a greater and more permanent future for Alabama.

One of the best results of this work in its bearing on the welfare of the university is the development of the recent movement inaugurated as a small beginning in 1905 for a new museum for Dr. Smith's collections; and which under the admirable leadership of Governor Comer, President Abercrombie, Mr. Hill Ferguson, president of the alumni society, Dr. Thomas M. Owen and other alumni, has developed into an important and successful movement for a greater university. The net results to-day are the two splendid buildings (Smith Hall and Comer Hall) already completed, and the academic building now under construction. Unquestion-

ably other important results will follow in the near future.

The association of his labors as state geologist with his labors as a university professor, has therefore enabled him to do to better advantage both his work for the intellectual development of the people of Alabama at the university, and the work for material development throughout the state.

NEW PURPOSE IN STATE DEVELOPMENT

Furthermore, in this double capacity Dr. Smith has contributed much to this new purpose in the state's development, namely, safeguarding the state's future welfare.

In the past, the chief idea of the state has been, and naturally so, to explore and publish its material resources, because material development has always been, and must continue to be, the important basis of intellectual growth, and even the older American states are still young. This present development of resources is the motive which has generally led to the establishment of state geological surveys; and great good has resulted along these lines. The exploration of hidden or unknown resources in different parts of the state; their advertisement to the world through the publication of geological reports has brought in new capital and population, has led to a wise use of home capital and labor, and has otherwise brought growth and prosperity to the state.

The new purpose in state development to which Dr. Smith has contributed requires that the state must not only encourage present development, but must also safeguard its own future. It is this purpose upon which the doctrine of conservation of resources is based.

This does not mean that the state should check development by endeavoring to save

for the future what the citizen of to-day needs for his own use. It means that the citizen of to-day, in the use of this material, while he has a right to what he needs, has no right to *waste* or to *misuse* that which he does not need to-day, but which his children and his children's children will need hereafter. For he neither created, nor can he add to these resources, nor replace them by others when the present supply has been once exhausted. He can and should, therefore, mine, prepare and use these resources with the least possible waste, and with the greatest possible efficiency; and it is the *duty of the state* to see that this is done.

Generations come and go. The life of the individual is short; his plans and ambitions relate to temporary purposes and present profits. The state goes on forever; and *the state must safeguard its own future*. In a recent notable decision, the United States Supreme Court says: "The state as the guardian of the public welfare possesses the constitutional right to insist that its natural advantages shall remain unimpaired by its citizens."

In the developing and carrying out this purpose, it is natural and proper that the state should employ its own geologists and engineers and chemists; that it should make use of the facilities of its university; and that it should teach the new purpose to its university students as well as to its maturer citizens.

The geologist and the engineer in the employ of private capital must look primarily for present profits. The geologist and engineer in the employ of the state must give primary consideration to the permanent public welfare. And the public welfare requires that, while in the development and use of material resources present profit can not be neglected and must not be made impossible, the way must be

found of using the resources of the state with minimum waste; in order that while not preventing the profit of to-day, resources not needed for to-day may be safeguarded for the needs of to-morrow.

CONSERVATION OF RESOURCES MUST HAVE A
RATIONAL BASIS

The enthusiast in preaching conservation of resources has often done harm to the doctrine by claiming that, in order to perpetuate the state's resources for future use, there should be curtailment in the use of these resources to-day. But among intelligent people, like the average citizens of the United States, any doctrine to succeed must have a rational basis. And the man who asks the question, "Why concern ourselves about the future supply of mineral resources which seem to be inexhaustible?" must be given a rational answer.

We may as well understand that the men of this generation will not mine, extract or use the state's mineral resources in such manner as to entail financial loss to themselves in order that a supply may be left for the use of the future. There will be no mineral industries without profit to those who make investments for development purposes. Men do not go into the mining business for their health! And any consideration of the doctrine of conservation of resources must be accompanied by equal consideration of the doctrine of conservation of capital, and conservation of human life.

We may as well understand also that neither the state's nor the nation's needs will be curtailed. These needs will increase with the extent and variety of our industries; and they will increase even more rapidly than our population.

Furthermore, the present generation has the power, and it has the right, to use these resources in so far as it will use them effi-

ciently. It has the right to use as much of these resources as it actually needs. But the statesmen of to-day should remember that in any state, and in the country at large, we have but one supply of mineral resources; and when this supply is gone we shall have no other to take its place. They should remember, further, that this one supply has required millions of years for its accumulation; that the demands on this supply will increase even more rapidly than our population; and that this supply, however large, measured in the terms of the needs of a great and rapidly growing country, is a limited supply. The supply is *not* inexhaustible.

Whether we consider the resources of the state of Alabama, or the resources of the United States, there can be no doubt as to the fact that, measured in terms of the life of the state or the nation, at the present increasing rate of consumption and waste, we shall, while the state and the nation are yet in their infancy, exhaust the mineral resources necessary as the essential basis for the welfare of succeeding generations.

Having this information at hand, neither the state nor the nation can shirk the responsibility resting upon it, on the claim that succeeding generations will probably discover other now unknown resources for their use; for such conclusion would be unjust and irrational. As irrational as it would be for the farmer to use up his farm's supply of provisions during the first half of the year, trusting to luck for the other half year's supply. The right of the present generation to use efficiently of these resources whatever it needs, carries with it the sacred obligation not to waste the great heritage that has come down to us for the use of all succeeding generations of Alabama's citizens.

It is therefore reasonable to expect that

the users of the mineral resources of the state and of the nation will pay for them such prices as will make profitable their mining and preparation without serious unnecessary waste of resources or loss of life.

The very abundance and cheapness of our resources have developed an American habit of waste which is the greatest menace to our future welfare. This waste of the past and present, and the rapidly increasing needs of the present and future entail on us a still greater obligation to strive for the highest possible efficiency in the future mining and use of these resources.

This building and the work of Dr. Smith which we celebrate here to-day are definite evidence of the fact that this new purpose has already taken hold of the people of Alabama, and that they propose to support both the university and the geological survey in such future investigations of the resources of this state as will bring about not only larger development and greater present and future prosperity, but also such investigations as will, by diminishing the waste in the mining and use of these resources, aid in perpetuating their supply for the future well-being of her people.

All unscientific or inefficient use of resources is waste; and the most important element in the movement for rational conservation is the fact that the seemingly necessary waste of to-day, through inquiry or research, or through changes in economic conditions, may become the avoidable waste of to-morrow.

CONSERVING THE LIVES OF MINERS

Having called attention to the growth of the new purpose in the development of the state, the *perpetuation of its essential resources*, let me call attention also to another phase of this new purpose, namely,

the conserving of the lives of the miners—the men connected with mining industry.

One of the facts that stands to our national discredit in comparison with the records of other countries, is the fact that of the men employed in mining operations in the United States the percentage of those that are killed in the mines is three times as great as that in other countries. In this respect, Alabama's record is bad, but no worse than that of many other of our mining states. In the mining and quarrying operations of all the states, the record is bad—in some much worse than in others. But all along the line there is an awakening not only as to these facts, but an awakened determination to remedy the evil. There is no better illustration of this than may be seen in the admirable movement for greater safety and efficiency in mining in Alabama, led by the Tennessee Coal and Iron and Railway Company.

The investigation into the causes of mine accidents by the federal government, the enactment of better mining laws among the different states, the increasing co-operative activity of the state mine inspectors; and best of all, the increasing safety precautions by the operators, and the development of a strong, earnest spirit of cooperation between the mine owners and the miners, gives promise of a serious general effort to make mining safer in the United States, and more creditable from the humanitarian standpoint as well as from the business standpoint.

APPLICATION OF THESE PRINCIPLES TO COAL MINING

But if we are going to attempt seriously to reduce the loss of life and the waste of resources in coal mining, the greatest of our mining industries, we must carry on investigations and inquiries to determine the causes and to devise preventive meas-

ures; we must promptly and adequately inform the miners and active mine officials of the results of such investigations and inquiries; we must revise our laws and regulations along rational lines, in accordance with the best information thus obtained; and we must look to a proper enforcement by the states of such laws and regulations. We must also go to the tap-root of the evil—that is, we must improve the economic conditions on which this great industry is based. We must seek the needed improvements—not simply through one or two of these remedial measures, but through each and every one of them.

Our coal industry in its phenomenal growth has nearly doubled during each succeeding decade of the past eighty years. It has had to do more than keep pace with our increasing population; for, while it supplied less than one ton of coal per capita to the American people in 1870, it has had to supply nearly six tons per capita during 1907. Its growth has been too rapid for systematic development; and the industry to-day represents a great host of scattered, warring, discouraged elements, without organization or cooperation.

If the rapidly increasing rate of coal production and waste of the past eighty years should continue for another century and a half—which is possible though hardly probable—the end of the next century would see the end of the supply of coal now considered available for use. The nation must perpetuate this supply by lessening the waste, and by more efficient use.

In this industry are now employed more than 700,000 miners, who work at some 6,000 different mines, and produce annually nearly 500,000,000 tons of coal. Not only is the nation increasingly dependent upon this coal for its heat and light and for

power for its varied manufacturing industries; but this coal and other mineral products now contribute about 65 per cent. of the total freight tonnage of the country; and the coal and steel are the essential factors in all our transportation facilities.

The economic conditions upon which coal mining is based in this country are so fundamentally bad, and the evil consequences are so far-reaching as to both time and extent, and are so essentially national in character, that this subject demands the earnest consideration of our best statesmen, as well as of our best engineers, whether with the federal or state governments or in the employ of private corporations.

In spite of the rapid growth in our demand for coal in Alabama and in the United States, the normal productive capacity of our coal mines, if operated continuously, would exceed this demand, and a ruinous competition exists not only between the operators in the same field, but between the operators of one field against those in another field or in another state where different mining laws and regulations are in force.

This competition is, first of all, driving out of the business the small operators, except where they find protection under local freight rates, and is forcing even the larger operator to mine coal under conditions which he can not approve, but from which he finds no escape. If he and his fellow operators endeavor to “get together” and place the price of coal at the mine on a reasonable basis, they may go to jail under either a federal or a state statute; and, as the only alternative, each must live (or succumb) by underbidding the other, which he can do only through following the wasteful and unsafe mining methods which prevail in this country to-day, in

spite of the desire of every operator to improve them.

Even when the demand for coal and the prices are at their best, under existing conditions the operator can mine only that part of his coal which can be taken out most cheaply and sold at the higher prices; and the remainder must be left underground in such shape as may preclude its future recovery. And thus we waste nearly 7,000,000 to 10,000,000 tons of coal in Alabama, and more than 250,000,000 tons of the nation's fuel supply.

But great as is this waste or loss of coal in mining, still greater is the loss in use of coal that is consumed in our furnaces. In the average power plant of to-day, less than ten per cent. of the energy of the coal is converted into actual work; the other 90 per cent. being used up in the furnace, the boiler, the engine and the shafting. Worse still, of the coal burned in producing the electric lights of this university—less than one per cent. of its energy is transformed into light; the other, more than 99 per cent. of the total energy being used up in the different steps of the transformation from coal into light.

The American mine owner is as humane as is the mine owner of any other country, and he would like to follow every practise and use every appliance for safety to be found in Great Britain, France, Belgium, Germany or elsewhere, but he pays his miners higher wages, and at the same time he receives for his coal at the mines half the price received for similar coal by the mine owners in those countries.

The coal industry needs and deserves fair treatment at the hands of the American people; and upon its receipt of such treatment depends in large measure not only the welfare of the operators, but also the welfare of the 700,000 miners who daily risk their lives in supplying the fuel

for the nation's comfort and convenience, and the welfare of the industry itself as an essential part of our future state and national development.

In all investigations for the betterment of the mining industry, there should be hearty cooperation between the federal government dealing with the broad general problems of value to the entire country, the states dealing with problems more or less local to themselves and the private corporations dealing with still more local or individual problems. Thus we shall have greatest efficiency, and largest results, at least cost.

MINERAL RESOURCES BUILD UP AND PERPETUATE MANUFACTURES AND AGRICULTURE

I am emphasizing these conditions concerning the mining of coal, because we all recognize the fact that the coal and iron industries of the country serve as a basis of our manufacturing and other varied industries. They also serve as a basis for our transportation facilities. These in turn furnish the markets for our surplus agricultural products. For a long time in Alabama and in the United States, agriculture was, and indeed it continues to be, the chief of all the great foundation industries; but the exportation of food products from the United States is diminishing, and in a few decades more the growth of our mining population and the population connected with manufactures based on our mineral industries, will be sufficient to consume and manufacture at home the agricultural products of the continent.

But I want to call your attention to one other important phase of the mineral industries of the country as a basis of our agricultural and general prosperity. With all of Dr. Smith's enterprise and ability, he has not yet discovered within the limits

of the state of Alabama any extensive deposits of phosphates or potash mineral fertilizers. We realize that more and more every year the success of our farmers seems to depend upon their use of these fertilizers, plus the general improvement of the soil. This is because of the fact that the phosphates, the potash and the nitrogen in our soils, the three great essential mineral articles of plant food, are being gradually used up, or washed out, and new supplies must be added artificially, in order that the plant may receive a sufficient quantity of these to meet its needs.

The millions of tons of coal which are yearly produced and consumed in the state of Alabama contain large quantities of nitrogen that ought to be saved and transformed into fertilizing materials. Furthermore, through not only your coal supply, but through the great water-powers that exist in Alabama, it will be possible to take nitrogen from the atmosphere and transform it into fertilizer materials for use under your crops.

You must also not only endeavor to find supplies of phosphate and potash in the state of Alabama, but, failing in this, you must produce other products that you may export in exchange for the phosphate and potash you may need to import. Furthermore, the systems of farming must be so modified as to diminish, year by year, soil exhaustion through the leeching out and washing away of these valuable constituents.

The mining industry and agriculture will go hand in hand in their efforts to build up and perpetuate the manufactures and other varied industries of this state, and will thus safeguard the public welfare for the future no less than that of the present.

The recent progress of this university and your geological survey, and the con-

struction and equipment of these new buildings which we celebrate to-day, are guarantees that Alabama's future as well as its present is in safe hands.

JOSEPH A. HOLMES

WASHINGTON, D. C.

CHARLES FAY WHEELER¹

It was with a sense of deep personal loss that the associates of Professor Wheeler learned of his death, March 5, at George Washington University Hospital. While those intimately associated with him were perhaps aware of his gradually failing strength, he was so cheerful in his greeting each day, so uncomplaining, that no one realized the extent or significance of his failing health.

The narrative of Professor Wheeler's early life indicates that his career as a botanist may have been the result of misfortune. Born June 14, 1842, at Mexico, Oswego County, N. Y., he spent his earliest years on the farm. In 1857 he entered Mexico Academy in his native town, but left that institution, as so many other young men left college at that time, to enter the army. He enlisted October 8, 1861, as a private in Company B, Seventh Regiment of the New York (Black Horse) Cavalry, to serve three years, but was mustered out with his company March 31, 1862. He again enlisted August 20, 1862, as a private in Company F, One Hundred and Forty-seventh Regiment of New York Infantry, to serve three years, and during the following winter was encamped with his regiment on the hill in the vicinity of the present location of Howard University. The exposure and hardships he was subjected to during this time proved too much for him to withstand, and on March 21, 1863, he was discharged by reason of disability, and in reality never fully recovered from the effects of service in the army.

Following his discharge from the federal army he was induced to go to friends at Hubbardston, Mich., where in the out-of-door life he led it was hoped he might regain his health.

¹ Read before the Botanical Society of Washington, May 28, 1910.