ISSUED BY DEFENSE COUNSEL, STATE OF TENN. vs. JOHN T. SCOPES.

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STATEMENT BY WILBUR A. NELSON,
(State Geologist of Tennessee.)

x( Biography.---Wilbur A. Nelson is State Geologist of Tennessee, president of the American Association of State Geologists, past president of the Tennessee Academy of Science, chairman, Executive Committee Southern Appalachian Power Conference 1923, member of the Executive Committee of the Division of States Relations of the National Research Council, member of the Council of the American Engineering Council, and president of the Monteagle Sunday School Assembly, of Monteagle, Tennessee, the leading interdenominational Chataugua and summer resort in the south, founded 43 years ago, and after September 1st, Corcoran Professor of Geology and head of the department of Geology, University of Virginia and State Geologist of Viaginia. He received the degree Bachelor of Science at Vanderbilt University, and the degree Master of Arts at Leland Sanford University. He has held responsible positions with commercial firms as well as in the service of the state. He is a fellow of the American Association for the Advancement of Science, a fellow of the Geological Society of America, member American Institute of Mining and Metalurgical Engineers, American Association Petroleum Geologists, Seismological Society of America, and other organizations. He has published a number of papers on geological and related subjects, both scientific and of a popular nature.)

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The different layers of rock which form the surface of the earth unfold a remarkable story of evolution. These rock layers may be read as clearly as the leaves of a book, and they are the book which tells the true history of the earth; and the buried remains of animal and plant life which they contain likewise show the rise of life and its development on this earth. All forms of life have changed and developed to meet the conditions which have existed on the earth, as it has developed to meet the conditions which have been developing from the beginning of geological time.

Tennessee is an ideal place in which to study and learn the story of the rock layers which have been laid down, from the earliest times in which any life existed up to the present. Life forms suitable for one period of the earth's history, proved unsuitable for another period, and so new forms, therefore, evolved through natural causes.

This is not a new study in Tennessee as geology and its study of buried animal and plant remains has been taught in this state since 1838, at which time Gerard Troost, one of the founders of the Philadelphia Academy of Science, was elected professor of Geology at the University of Nashville, and three years later was elected State Geologist of Tennessee. From that date to the present time, this science, dealing with the age and study of the earth, and its rocks and the buried life which they contain, has been continuously taught in Tennessee.

Such teaching could not have been carried on through 97 years of time, unless the teaching of evolution had been permitted as it was permitted by our religious ancestors who formed this state.

We know that streams and rivers carry sediment; that muddy waters are full of the soil of some field, washed into a nearby stream by a hard rain, and some such soil, when it once gets into a stream, starts on a long journey to the ocean. Most of the streams in this section are muddy for many months in each year, and this mud, which is the soil washed from our gullied hillsides, in this particular case, goes down the Tennessee River, into the Mississippi River and to the Gulf of Mexico.

We know that at the mouth of the Mississippi River the sediments brought down by this river are deposited so rapidly that land is formed which is extending out into the Gulf of Mexico at the rate of many feet a year. As a rule, these processes of weathering of rocks to produce soil, of erosion of this soil, and of deposition of this transported soil through rivers into some nearby sea or ocean, takes place so slowly, as time is generally measured, that we can only see through detailed and scientific observation the results within our own lifetime. But at the delta of the Mississippi River, this very process is taking place so rapidly that any one can easily measure it year by year and can understand that these same processes have been taking place through all geologic time, and in each and every part of the world.

We also know that practically all of the earth has at some time or other, been covered by water, and in these ancient seas, life has existed, which has left its record to us in fossil form. It must, however, also be understood that large parts of our present water areas were at some period in past geologic time also land areas. These seas have come and gone over limited areas of the earth's surface many times during the geologic history of the earth.

We know that originally the mouth of the Mississippi River was near Cairo, Illinois, and that all of the Mississippi Valley, as we now know it, was at that time (which was the close of the Cretaceous Period) a part of a much larger Gulf of Mexico, than the one that now exists. All of West Tennessee, during this time, was in a northern extension of the Gulf of Mexico, and the fine china clay deposits of that section were laid down in shallow water at the time tropical plants flourished in that section.

East Tennessee is made up of many layers of rocks, limestone, shale and sandstone, all of which were likewise laid down under water, and many of these layers contain the remains of animal and plant life. Some of the oldest rocks which contain animal life are found in East Tennessee. They are known as Cambrian rocks, and in these rocks occur the first abundant remains of sea form of life. This was the age of the early invertebrates. These rocks are well exposed to the east of Dayton in the East Tennessee Valley region.

Then came the time interval which the geologist calls the Ordovician, the time when primitive fishes, corals, and land plants came into existence. Some of these first corals in fossil form have been found in the western edge of Dayton. This time interval was followed by another series of rocks which, in East Tennessee, contain the red iron ore deposits whichare used by the iron furnaces of this section. The rocks of this age are known as the Silurian, and during this time life further developed and scorpions and lung fishes came into existence.

The series goes on. Layer after layer of rocks were laid down, each series of which has been given a name by geologists so that they can be easily referred to. Next came the Great Age of fishes, and their remains are found in the rocks which the geologists call the Devonian and Mississippion series, The black s late, which crops out at the foot of Waldens Ridge,as well as the limestones lying above it, which form the side of the mountain to the west of Dayton, are layers belonging to these series. These rocks are full of the remains of animal life.

Then came the period in which the ancient plants flourished and produced great coal deposits, the age which has been called the Carboniferous. The extensive coal deposits of the Tennessee coal field. the edge of which caps the mountain a few miles west of Dayton, are of this age, and wonderfully preserved plant remains are found in the slates which lie on top of the different coal seams. This is a fact well known by the coal miners of this section. And what has been s tated above as to Tennessee is but one illustration of how the different geolic periods passed and life developed over the earth.

And even when this Carboniferous period in the development of the earth has been reached, we are still many millions of years back from the age of man; We must still pass thru many geological time periods, thru that age known as the Permian, when land vertebrates first arose; thru the Triassic, when reptillian mammals arose; thru the Jurassic, whey flying reptiles were in existence. This was the Age of Reptiles. Then into the Cretaceous, when flowering plants came into existence, and a great group of the reptiles known as dinnosaurs, became extinct.

And then we come to that period in the earth's history, at the beginning of which the ancient mammals and birds were first known to exist. Fossil remains show clearly that birds evolved from flying reptiles. This is the Great Age of Mammals. Thru this period, the modern life forms developed. A period of glacial activity too place, during which five distinct glacial stages existed, one after the other, with four interglacial intervals, and man-like beings came into being at least the beginning of this time. Such, very briefly, is an account of the evolution of the earth from Cambrian time to the present, with a brief outline of the life forms which existed during these different periods. We know that this took many millions of years, and yet we also know that the earth existed untold millions of years before Cambrian time.

For the formation of the earth and its early stages we must turn to the science of Astronomy. The relations of the earth to the stars and the planets are shown in the depths of the heavens, and there must exist in the heavens those cosmic conditions which gave rise to our world and the other planets of our system. Through the telescope and spectroscope, the astron-oners have solved many of these secrets.

But what of the age of the earth measured in years as we measure other happenings? From the brief outline just given one can see that it has been in existence unknown millions of years, but just how many it is impossible to say.

We can, however, measure back to the more recent events in Geologocal time to the last ice age, before which we know man existed, and got a fairly accurate result, in terms of years. Geologists from the scientific studies they have made, have reached the conclusion that from the present time back to the close of the glacial state known as the Wisconsin, the period of the last ice stage, that the time interval is between twenty-two thousand and thirty-five thousand years, and man is known to have existed before this time.

One of the most accurate ways in which to measure such time intervals, is by measuring and counting the light colored and dark colored bands of clay, deposited by the melting of the ice sheet in the fresh water lakes which existed on the edge of these continental glaciers, as it retreated to its present position in the north polar regions. Each dark layer of clay was laid down during one winter and each light layer during one summer. By such detailed studies, it has been determined that it has taken, approximately, 5000 years for the glaciers of Sweden to melt back 270 miles, and it is further known that ~~time~~ this melting took place 8500 years ago. We know that the glaciers in North America extended into the northern part of the United

States and reached as far south as the Ohio River. We know that now their southern edge lies far to the north in Northern Canada over a thousand miles away. We know that it took approximately 4000 years for the continental glacier which last covered the New England States to melt back from Hartford, Connecticutt, to St. Johnsburg, Vermont. This is only one way of measuring in years some of the more recent geological happenings. There are many other methods that could be given if it were necessary.

In connection with evolution, it is especially of interest to note that the relative ages of the rocks correspond closely to the degrees of complexity of organization shown by the fossils in those rocks. The simpler organisms being found in the more ancient rocks, each type of organism becoming more and more complex as we come nearer to the present day, man amd his fossil and cultural remains being no exception.

It, therefore, appears that it would be impossible to study or teach geology in Tennessee, or elsewhere, without using the theory of evolution.