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S6-1

ANCIENT MICROBES AND THEIR DNA: WHAT MIGHT THEY TELL US ABOUT EVOLUTION AND THE ORIGIN OF LIFE?

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During the last decade of the twentieth century numerous microorganisms were isolated from ancient materials. These microbes came from both prokaryotic domains Bacteria and Archaea. The ages of these microbes ranges from approximately 0.03 million years (mya) to up to 250 mya. In addition to isolating the living microbes numerous researchers have been able to amplify and sequence fragments of DNA from samples of the similar ages taken from numerous sites. All of these isolations are producing an ever growing mass of evidence indicating that microbes are indeed able to survive long term entrapment in ancient geological materials. These developments also provide a tremendous insight into the state of microbial biology from the Permian to the Mesozoic. The genetic and physiological properties of these microbes, when examined, can reveal much about the rates at which evolution may occur within microbes and throughout time. That said, the full understanding of the data can only arise if the ages of the microbes are recognized and accepted. These powerful discoveries are, however, being disputed due largely to misunderstanding of the techniques being used to date the geological materials and isolate the biological samples. These techniques actually combine some of the finest microbiological and geological methodology presently available. They are similar to those used, to date and verify, the ages of fossilized animals and plants and to understand their evolutionary history. This seminar will trace that evidence in comparison with paleontological methods. Listeners will be able to understand and appreciate the rigor being allied to this exciting field and will learn about some of the newest discoveries that have occurred. This research area continues to unfold and the evidence that microbes can survive for long periods continues to grow. Yet the greatest discoveries do not lie within the rocks. Rather they lie within the microbes themselves. The talk will conclude by providing an overview of the lessons being learned about the mechanisms for survival, the potential for ancient materials to act as a universal gene bank and the potential rates of evolution within critical genes.