Jack William Szostak Biography

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Biography

Jack W. Szostak, a professor of **genetics** and a biochemist at Massachusetts General Hospital developed the **Yeast** Artificial **Chromosome** (**YAC**), in collaboration with Harvard biochemist Andrew Murray. The YAC, developed in 1980s, was the first artificial (synthetic) chromosome. YAC chromosomes are used by scientists to study and map chromosomes. In addition, YACs are now used as **cloning vectors**.

Szostak is also a principal investigator affiliated with the Howard Hughes Medical Institute.

Szostak's work also sheds new light upon the biological processes responsible for the origin of life on Earth. In a continuation of the type of work started by American scientists Stanley Miller and **Harold Urey**, who, in the 1950's, were able to form amino acids from inorganic materials present in Earth's early atmosphere. Szostak's work further advanced such studies by creating a synthetic entity capable of **replication**. More recent work by Szostak has focused upon the role of **RNA** as an enzyme in biochemical reactions. Such studies may shed light on the role primitive RNAs may have played in primitive **cell** organization and **biochemistry**.

By creating random RNA, Szostak is able to test those RNAs and the genetic code sequences they contain against different environmental conditions that, in effect, reflect differing **selection** pressures. Szostak and his coworkers are then able to evaluate the binding functions and reactions of the synthetic RNAs. By making a large number of copies of the RNA, Szostak is then able to mimic natural **mutation** driven alterations to the RNA in an effort to evaluate how changes in the RNA sequences affect their role in cellular reactions and functions. Szostak can selectively study the role of RNAs in reactions by developing specific RNAs that function as **enzymes** in those reactive pathways. Once again, the role of the RNAs can be evaluated in terms of the effect of mutations on previously observed reactions.

The degree to which primitive RNAs were able to catalyze reactions is critical. If, Szostak argues, RNAs acting as enzymes (ribozymes) were able to catalyze a large number of reactions, then this ability supports hypotheses that utilize RNA as a primitive organizer in early cell forms. Such organizer RNA could have originated from random assortments of nucleotides in the primitive Earth seas or pools formed by runoff. Any random assembly of nucleotides that was capable of replication could have easily become widespread.