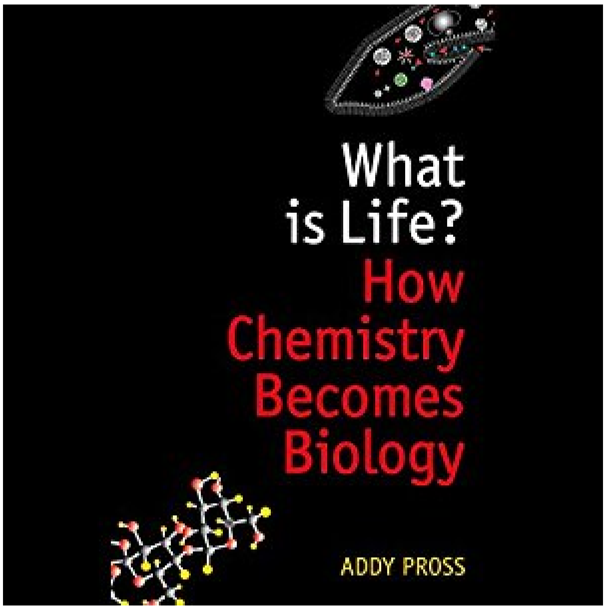
What Is Life?: How Chemistry Becomes Biology



Synopsis

Seventy years ago, Erwin Schrdinger posed a simple, yet profound, question: What is life?. How could the very existence of such extraordinary chemical systems be understood? This problem has puzzled biologists and physical scientists both before, and ever since. Living things are hugely complex and have unique properties, such as self-maintenance and apparently purposeful behaviour which we do not see in inert matter. So how does chemistry give rise to biology? Did life begin with replicating molecules, and, if so, what could have led the first replicating molecules up such a path? Now, developments in the emerging field of 'systems chemistry' are unlocking the problem. Addy Pross shows how the different kind of stability that operates among replicating entities results in a tendency for certain chemical systems to become more complex and acquire the properties of life. Strikingly, he demonstrates that Darwinian evolution is the biological expression of a deeper and more fundamental chemical principle: the whole story from replicating molecules to complex life is one continuous coherent chemical process governed by a simple definable principle.

Book Information

Audible Audio Edition

Listening Length: 6 hoursÂ andÂ 50 minutes

Program Type: Audiobook

Version: Unabridged

Publisher: Audible Studios

Audible.com Release Date: October 14, 2014

Whispersync for Voice: Ready

Language: English

ASIN: B00NJ2Z19G

Best Sellers Rank: #7 inÂ Books > Audible Audiobooks > Science > Chemistry #62 inÂ Books > Science & Math > Biological Sciences > Biology > Molecular Biology #117 inÂ Books > Engineering & Transportation > Engineering > Bioengineering > Biochemistry

Customer Reviews

This book tries to answer three related questions: What is life? How did it emerge? How can we make it? They are related because, for instance, if we knew what is life we could conjecture how it emerged and if we were able to create it we should then understand it. It was Feynman who said that he could only understand things when he was able to create them.Of the three questions, the most difficult to answer it is how life emerged on Earth. It is difficult because the oldest fossil evidence is 3,600 million years old, but life could have appeared on Earth between 200 and 400 milions before that and, although there are some proposals about the environment where it appeared, there is nothing certain. This subject is so difficult that reputed scientists have proposed to solve it saying that life came from space. Naturally that only puts the problem somewhere else: where and how did life emerge in some other planet.Since we are not yet ready to create life in the lab, the author of the book concentrates in trying to answer what is life. The answer is that life is part of a special chemistry that we have been able to perform in the lab experiment after experiment in the last 40 years: it is replicative chemistry. There are several experiments that are explained and that mainly consist in RNA replicating itself, mutating and evolving in a way that the fast replicator is the one that wins. Complexification is also part of the story. When two selected RNA molecules are put together they replicate more times and more quickly than just one of then due to cross catalysis.

Addy Pross is so enthusiastic about systems chemistry that I feel mean giving his book a relatively negative review. The primary problem I have with the book is that it’s extremely repetitive.Basically Pross says that there is a new field called "systems chemistry." Systems chemistry studies chemical replicators, chemical molecules (and networks of molecules) that are capable of copying themselves in an environment that has the right sorts of components. (Actually systems chemistry is somewhat more than that.) Replication is important because one can then look at populations of replicating chemicals in the same way that we look at biological populations, i.e., the best replicators win. Of course there can be environmental niches, etc., but that’s the main point.Pross thinks this is important because it integrates biology and pre-biological chemistry: they are both about replication. He also thinks its important because it leads to an analogue of the Second Law of Thermodynamics. In general under the second law matter tends toward increasing stability, i.e., lower energy levels. Pross’s analogue is that replicating systems tend toward what he calls dynamic kinetic stability. But all that means is that the better replicators win. I don’t think it’s appropriate to act as if this is a major discovery when replication applies to chemistry.Pross also says that he and his colleagues showed that replicators that are able to capture energy can be better replicators than those that don’t. The reason is that the energy enables the chemical reactions involved in the replication to proceed faster -- and hence for those replicators to be better at replicating. This, he says, is the origin of metabolism. That’s a nice idea.

Natural: A Guide to Cultivating Mindfulness in Everyday Life Handbook of Freshwater Fishery Biology, Volume 2: Life History Data on centrarchid Fishes of the United States and Canada (Handbook of Freshwater Fishery Biology) When Breath Becomes Air Gordon Matta-Clark: Experience Becomes the Object This Being, That Becomes: The Buddha's Teaching on Conditionality (Buddhist Wisdom in Practice) When Man Becomes Prey: Fatal Encounters with North America's Most Feared Predators What Becomes of the Brokenhearted: A Memoir Moonlight Becomes You Moonlight Becomes You by Clark, Mary Higgins (2009) Audio CD The Next Africa: An Emerging Continent Becomes a Global Powerhouse When Religion Becomes Lethal: The Explosive Mix of Politics and Religion in Judaism, Christianity, and Islam Quantum Mechanics! The How's and Why's of Atoms and Molecules - Chemistry for Kids - Children's Chemistry Books Sterling Test Prep CLEP Chemistry Practice Questions: High Yield CLEP Chemistry Questions Sterling DAT General Chemistry Practice Questions: High Yield DAT General Chemistry Questions MCAT Chemistry and Organic Chemistry: Content Review for the Revised MCAT Principles of Colloid and Surface Chemistry, Third Edition, Revised and Expanded (Undergraduate Chemistry: A Series of Textbooks) Physical Chemistry Plus MasteringChemistry with eText -- Access Card Package (3rd Edition) (Engel Physical Chemistry Series) Clinical Chemistry: Techniques, Principles, Correlations (Bishop, Clinical Chemistry)