EVOLUTION AT THE INTERSECTION OF BIOLOGY AND MEDICINE STEPHEN LEWIS pdf

1: Stephen Lewis | University of Chester - www.enganchecubano.com

Editors' Abstract In his review of the various intellectual and practical applications and limitations of evolutionary medicine, including its potential weaknesses but its promise, too, Lewis observes that so far much of the work in evolutionary.

It was used again in in a work entitled Philosophiae naturalis sive physicae: The term came into its modern usage with the six-volume treatise Biologie, oder Philosophie der lebenden Natur â€"22 by Gottfried Reinhold Treviranus , who announced: The science that concerns itself with these objects we will indicate by the name biology [Biologie] or the doctrine of life [Lebenslehre]. Although modern biology is a relatively recent development, sciences related to and included within it have been studied since ancient times. Natural philosophy was studied as early as the ancient civilizations of Mesopotamia , Egypt , the Indian subcontinent , and China. However, the origins of modern biology and its approach to the study of nature are most often traced back to ancient Greece. Especially important are his History of Animals and other works where he showed naturalist leanings, and later more empirical works that focused on biological causation and the diversity of life. Medicine was especially well studied by Islamic scholars working in Greek philosopher traditions, while natural history drew heavily on Aristotelian thought, especially in upholding a fixed hierarchy of life. It was then that scholars discovered spermatozoa , bacteria , infusoria and the diversity of microscopic life. Investigations by Jan Swammerdam led to new interest in entomology and helped to develop the basic techniques of microscopic dissection and staining. In the early 19th century, a number of biologists pointed to the central importance of the cell. Then, in , Schleiden and Schwann began promoting the now universal ideas that 1 the basic unit of organisms is the cell and 2 that individual cells have all the characteristics of life , although they opposed the idea that 3 all cells come from the division of other cells. Thanks to the work of Robert Remak and Rudolf Virchow , however, by the s most biologists accepted all three tenets of what came to be known as cell theory. Carl Linnaeus published a basic taxonomy for the natural world in variations of which have been in use ever since , and in the s introduced scientific names for all his species. Although he was opposed to evolution, Buffon is a key figure in the history of evolutionary thought ; his work influenced the evolutionary theories of both Lamarck and Darwin. The discovery of the physical representation of heredity came along with evolutionary principles and population genetics. In the s and early s, experiments pointed to DNA as the component of chromosomes that held the trait-carrying units that had become known as genes. A focus on new kinds of model organisms such as viruses and bacteria , along with the discovery of the double helical structure of DNA in , marked the transition to the era of molecular genetics. From the s to present times, biology has been vastly extended in the molecular domain. Finally, the Human Genome Project was launched in with the goal of mapping the general human genome. This project was essentially completed in , [23] with further analysis still being published. The Human Genome Project was the first step in a globalized effort to incorporate accumulated knowledge of biology into a functional, molecular definition of the human body and the bodies of other organisms. Foundations of modern biology Cell theory Human cancer cells with nuclei specifically the DNA stained blue. The central and rightmost cell are in interphase , so the entire nuclei are labeled. The cell on the left is going through mitosis and its DNA has condensed. Cell theory Cell theory states that the cell is the fundamental unit of life , that all living things are composed of one or more cells, and that all cells arise from pre-existing cells through cell division. The cell is also considered to be the basic unit in many pathological processes. Finally, cells contain hereditary information DNA , which is passed from cell to cell during cell division. Research into the origin of life, abiogenesis , amounts to an attempt to discover the origin of the first cells. Evolution A central organizing concept in biology is that life changes and develops through evolution, and that all life-forms known have a common origin. The theory of evolution postulates that all organisms on the Earth , both living and extinct, have descended from a common ancestor or an ancestral gene pool. This universal common ancestor of all organisms is believed to have appeared about 3. Darwin theorized that species flourish or die when subjected to the processes of natural selection or selective breeding. Widely varied approaches to biology generate information about phylogeny. These include the comparisons of DNA sequences , a product of molecular biology more particularly genomics , and comparisons of fossils or other records of ancient organisms, a product of paleontology. For a summary of major events in the evolution of life as currently understood by biologists, see evolutionary timeline. Evolution is relevant to the understanding of the natural history of life forms and to the understanding of the organization of current life forms. But, those organizations can only be understood in the light of how they came to be by way of the process of evolution. Consequently, evolution is central to all fields of biology. Genetics Genes are the primary units of inheritance in all organisms. A gene is a unit of heredity and corresponds to a region of DNA that influences the form or function of an organism in specific ways. All organisms, from bacteria to animals, share the same basic machinery that copies and translates DNA into proteins. The translation code from RNA codon to amino acid is the same for most organisms. For example, a sequence of DNA that codes for insulin in humans also codes for insulin when inserted into other organisms, such as plants. A chromosome is an organized structure consisting of DNA and histones. In eukaryotes, genomic DNA is localized in the cell nucleus , or with small amounts in mitochondria and chloroplasts. In prokaryotes, the DNA is held within an irregularly shaped body in the cytoplasm called the nucleoid. In turn, ACTH directs the adrenal cortex to secrete glucocorticoids , such as cortisol. The GCs then reduce the rate of secretion by the hypothalamus and the pituitary gland once a sufficient amount of GCs has been released. All living organisms , whether unicellular or multicellular , exhibit homeostasis. After the detection of a perturbation, a biological system normally responds through negative feedback that stabilize conditions by reducing or increasing the activity of an organ or system. One example is the release of glucagon when sugar levels are too low. Basic overview of energy and human life. Energy The survival of a living organism depends on the continuous input of energy. Chemical reactions that are responsible for its structure and function are tuned to extract energy from substances that act as its food and transform them to help form new cells and sustain them. The organisms responsible for the introduction of energy into an ecosystem are known as producers or autotrophs. Nearly all such organisms originally draw their energy from the sun. The majority of the rest of this biomass and energy are lost as waste molecules and heat. The most important processes for converting the energy trapped in chemical substances into energy useful to sustain life are metabolism [44] and cellular respiration. Molecular biology , Cell biology , Genetics , and Developmental biology Schematic of typical animal cell depicting the various organelles and structures. Molecular biology is the study of biology at the molecular level. Molecular biology is a study of the interactions of the various systems within a cell, including the interrelationships of DNA, RNA, and protein synthesis and how those interactions are regulated. The next larger scale, cell biology , studies the structural and physiological properties of cells , including their internal behavior , interactions with other cells, and with their environment. This is done on both the microscopic and molecular levels, for unicellular organisms such as bacteria , as well as the specialized cells of multicellular organisms such as humans. Understanding the structure and function of cells is fundamental to all of the biological sciences. The similarities and differences between cell types are particularly relevant to molecular biology. Anatomy is a treatment of the macroscopic forms of such structures organs and organ systems. Genetics provides research tools used in the investigation of the function of a particular gene, or the analysis of genetic interactions. Within organisms, genetic information is physically represented as chromosomes , within which it is represented by a particular sequence of amino acids in particular DNA molecules. Developmental biology studies the process by which organisms grow and develop. Developmental biology, originated from embryology , studies the genetic control of cell growth , cellular differentiation , and "cellular morphogenesis ," which is the process that progressively gives rise to tissues , organs , and anatomy. Model organisms for developmental biology include the round worm Caenorhabditis elegans , [50] the fruit fly Drosophila melanogaster , [51] the zebrafish Danio rerio , [52] the mouse Mus musculus , [53] and the weed Arabidopsis thaliana. Physiology Physiology is the study of the mechanical, physical, and biochemical processes of living organisms function as a whole. The theme of "structure to function" is central to biology. Physiological studies have traditionally been divided into plant physiology and animal physiology , but some principles of physiology are universal, no matter what particular organism is being studied. For example, what is learned about the physiology of yeast cells can also apply to human cells. The field of animal physiology extends the tools and methods of human physiology to non-human species. Plant physiology borrows techniques from both research fields. Physiology is the study the interaction of how, for example, the nervous , immune , endocrine , respiratory , and circulatory systems, function and interact. The study of these systems is shared with such medically oriented disciplines as neurology and immunology. Evolutionary Evolutionary research is concerned with the origin and descent of species , and their change over time. It employs scientists from many taxonomically oriented disciplines, for example, those with special training in particular organisms such as mammalogy , ornithology , botany , or herpetology , but are of use in answering more general questions about evolution. Evolutionary biology is partly based on paleontology , which uses the fossil record to answer questions about the mode and tempo of evolution, [57] and partly on the developments in areas such as population genetics. Systematic A phylogenetic tree of all living things, based on rRNA gene data, showing the separation of the three domains bacteria , archaea , and eukaryotes as described initially by Carl Woese. Trees constructed with other genes are generally similar, although they may place some early-branching groups very differently, presumably owing to rapid rRNA evolution. The exact relationships of the three domains are still being debated. Intermediate minor rankings are not shown. Systematics Multiple speciation events create a tree structured system of relationships between species. The role of systematics is to study these relationships and thus the differences and similarities between species and groups of species. Monera ; Protista ; Fungi ; Plantae ; Animalia. Modern alternative classification systems generally begin with the three-domain system: Archaea originally Archaebacteria ; Bacteria originally Eubacteria and Eukaryota including protists , fungi , plants , and animals [63] These domains reflect whether the cells have nuclei or not, as well as differences in the chemical composition of key biomolecules such as ribosomes. Outside of these categories, there are obligate intracellular parasites that are "on the edge of life" [64] in terms of metabolic activity, meaning that many scientists do not actually classify such structures as alive, due to their lack of at least one or more of the fundamental functions or characteristics that define life. They are classified as viruses , viroids , prions , or satellites. The scientific name of an organism is generated from its genus and species. For example, humans are listed as Homo sapiens. Homo is the genus, and sapiens the species. When writing the scientific name of an organism, it is proper to capitalize the first letter in the genus and put all of the species in lowercase. It includes ranks and binomial nomenclature.

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2: The Structure of Evolutionary Theory â€” Stephen Jay Gould | Harvard University Press

This is the personal academic site of Dr Stephen Lewis. It contains information on his research interests. My research is concerned with exploring biological and philosophical aspects of the concepts of illness, disease and health and considering what, by extension, these notions say about life and death, living and dying, in general.

These cases disturbed Yun, then a Stanford radiology resident. But they also intrigued him. Having studied evolutionary biology in college, Yun tried fitting these medical failuresinto that framework. His mind wandered to the early days of humans when heart disease was a rare trigger of death. In the prehistoric era, a more likely cause of death would have been an attack by a predator. The blood forms clots and the blood vessels tighten, together slowing blood loss, and inflammation kicks in to combat infection. Medical myth buster Returning his attention to the modern times, Yun observed that predation as a trigger of the trauma response had virtually disappeared in modern humans. Furthermore, distinctly modern conditions such as smoking and high blood pressure inadvertently trigger the trauma response, which, by activating inflammation, clotting and vessel narrowing, create what we now interpret as atherosclerosis. Distressingly, Yun saw that many current treatments for heart disease, such as propping open clogged arteries through angioplasty or stenting, trigger this ancient trauma response. Vessels irritated by the intrusions simply choke up again. Perhaps a little respect for human evolution was in order. A few dozen physicians and medical researchers at institutions throughout the world had begun in the s to pursue this same line of thought. The New Science of Darwinian Medicine. Nesse worked on the book while spending a sabbatical year at Stanford. Because doctors end up with false beliefs about disease, according to University of Michigan psychiatrist Randolph Nesse, MD, considered to be the founder of Darwinian medicine. Bacteria and viruses become less virulent the longer the interaction with the host species has been going on. Natural selection would seem to favor lower virulence, as the host must remain mobile enough to interact with others to spread the infecting organism. Aging happens because parts wear out. Rather than a degenerative disease, aging could be viewed as a genetic trade-off. Genes that offer advantages in youth might cause the problems seen with aging and eventually death. For example, strong immune defenses protect against infection but these same responses also inflict continual, low-level tissue damage. Annoying responses to infection â€” such as fever, anemia and diarrhea â€” are unnecessary and should be alleviated with drugs. Defenses are often confused with disease states. Fever and low iron levels have evolved to combat invading bacteria, while vomiting and diarrhea help flush the body of infection and toxins. While each of these defenses can cause problems in the extreme, blindly blocking them could be deadly. The three authors â€” Nesse; Stephen Stearns, PhD, an evolutionary biologist from Yale; and Gil Omenn, MD, PhD, a geneticist and current president of the American Association for the Advancement of Science â€” argue for including questions about evolution in medical licensing exams, ensuring evolutionary expertise in agencies funding biomedical research and incorporating evolution into every relevant class from high school on. So, where can students take a course in evolution and medicine? In dozens of undergraduate programs across the country, and scores more worldwide, but not in any U. A query of an American Association of Medical Colleges database that contains detailed information about the course offerings of the majority of U. Nesse, Stearns and others have been trying to convince medical school deans to incorporate evolutionary ideas into their curricula, but so far, little luck. They know that deans feel beleaguered by demands to add new subjects to the already crowded schedule â€” nutrition, alcoholism and aging to name a few. It ties together medical education instead of leaving it hanging as 50, discrete facts. And we need to be sure that students have the basic knowledge to integrate them into their thinking. A full course in Darwinian medicine, however, probably exceeds these current needs. Another route evolution can take Perhaps part of the problem in convincing medical practitioners to embrace evolution is the nature of the science. Add to this the fact that the field has failed so far to provide clinically useful findings and you see why medical schools lack interest, says Lewis. These days Yun, now a Stanford staff physician, and Stanford radiology resident Patrick Lee, MD, are partners at Palo Alto Investors, where evolutionary insights guide their health-care investment recommendations. Drug-delivery systems for treating kidney disease intravenously are out; delivering the drugs directly to the kidneys to bypass the trauma response is in. Learn more about evolutionary medicine at www. If a product makes sense from the evolutionary perspective, reducing the trauma response rather than exacerbating it, he and like-minded physicians are interested.

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3: Department of Pharmacology

Evolutionary Medicine and Health: New Perspectives Evolution at the intersection of biology and medicine / Stephen Lewis -- The importance of evolution for.

These are the best examples of why evolution is so pertinent to contemporary medicine. The chapters are provocative and force students to think in new ways. In some chapters, standard practice is turned on its head. We need future health practitioners to be thinking outside of the box. This book is an incredibly important contribution to the literature. Smith, and James J. Human Evolution, Diet, and Nutrition: Diabesity and Darwinian Medicine: Lindberg, and Stig A. An Evolutionary Perspective, Andrea S. Not by Bread Alone: Chisholm and David A. An Evolutionary Approach, Tessa M. Pollard and Nigel Unwin; 9. An Evolutionary Perspective on Premenstrual Syndrome: Swain Ewald, and Paul W. Breastfeeding and Mother-Infant Sleep Proximity: Why Words Can Hurt Us: Evolution and Modern Behavioral Problems: The Case of Addiction, Daniel H. Evolutionary Medicine and Obesity: The Developmental Origins of Adult Health: Atherosclerosis as an Illustration, Paul W. Genes, Geographic Ancestry, and Disease Susceptibility: Crews and Linda M. From Ancient Seas to Modern Disease: Evolution and Congestive Heart Failure, E.

4: - NLM Catalog Result

Evolutionary Medicine and Health: New Diabesity and Darwinian Medicine: The Evolution Evolution at the Intersection of Biology and Medicine, Stephen Lewis.

Smith, and James J. McKenna provide an up-to-date and thought-provoking introduction to the field with this new collection of essays. Ideal for courses in evolutionary medicine, medical anthropology, and the evolution of human disease, Evolutionary Medicine and Health: New Perspectives presents twenty-three original articles that examine how human evolution relates to a broad range of contemporary health problems including infectious, chronic, nutritional, and mental diseases and disorders. Topics covered include disease susceptibility in cultural context, substance abuse and addiction, sleep disorders, preeclampsia, altitude-related hypoxia, the biological context of menstruation, and the role of stress in modern life. An international team of preeminent scholars in biological anthropology, medicine, biology, psychology, and geography contributed the selections. Together they represent a uniquely integrative and multidisciplinary approach that takes into account the dialogue between biology and culture as it relates to understanding, treating, and preventing disease. A common theme throughout is the description of cases in which biological human development conflicts with culturally based individual behaviors that determine health outcomes. Detailed, evidence-based arguments make the case that all aspects of the human condition covered in the volume have an evolutionary basis, while theoretical discussions using other empirical evidence critique the gaps that still remain in evolutionary approaches to health. Evolutionary Medicine and Health: In addition, the editors provide introductions to each essay and an extensive bibliography that represents a state-of-the-art survey of the literature. A companion website at www. Written in an engaging style that is accessible to students, professionals, and general readers, this book offers a unique look at how an evolutionary perspective has become increasingly relevant to the health field and medical practice. Politics, Nutrition, and Diet 2. Human Evolution, Diet, and Nutrition: Diabesity and Darwinian Medicine: Lindberg, and Stig A. An Evolutionary Perspective, Andrea S. Not by Bread Alone: Chisholm and David A. An Evolutionary Approach, Tessa M. Pollard and Nigel Unwin 9. An Evolutionary Perspective on Premenstrual Syndrome: Swain Ewald, and Paul W. Breastfeeding and Mother-Infant Sleep Proximity: Why Words Can Hurt Us: Evolution and Modern Behavioral Problems: The Case of Addiction, Daniel H. Evolutionary Medicine and Obesity: The Developmental Origins of Adult Health: Atherosclerosis as an Illustration, Paul W. Genes, Geographic Ancestry, and Disease Susceptibility: Crews and Linda M. From Ancient Seas to Modern Disease: Evolution and Congestive Heart Failure, E. Nesse Evolutionary Medicine and Health: New Perspectives The specification in this catalogue, including without limitation price, format, extent, number of illustrations, and month of publication, was as accurate as possible at the time the catalogue was compiled. Due to contractual restrictions, we reserve the right not to supply certain territories.

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5: Evolution At The Intersection Of Biology And Medicine - ~sjlewis

Evolution At The Intersection Of Biology And Medicine (Chapter Title) more by Stephen Lewis Editors' Abstract In his review of the various intellectual and practical applications and limitations of evolutionary medicine, including its potential weaknesses but its promise, too, Lewis observes that so far much of the work in.

Smith, and James J. Human Evolution, Diet, and Nutrition: Diabesity and Darwinian Medicine: Lindberg, and Stig A. An Evolutionary Perspective, Andrea S. Not by Bread Alone: Chisholm and David A. An Evolutionary Approach, Tessa M. Pollard and Nigel Unwin ; 9. An Evolutionary Perspective on Premenstrual Syndrome: Swain Ewald, and Paul W. Breastfeeding and Mother-Infant Sleep Proximity: Why Words Can Hurt Us: Evolution and Modern Behavioral Problems: The Case of Addiction, Daniel H. Evolutionary Medicine and Obesity: The Developmental Origins of Adult Health: Atherosclerosis as an Illustration, Paul W. Genes, Geographic Ancestry, and Disease Susceptibility: Crews and Linda M. From Ancient Seas to Modern Disease: Evolution and Congestive Heart Failure, E. Jennifer Weil ; Nesse show more Review quote This is a wonderful addition to Evolutionary Medicine, and both fill a unique niche. These are the best examples of why evolution is so pertinent to contemporary medicine. The chapters are provocative and force students to think in new ways. In some chapters, standard practice is turned on its head. We need future health practitioners to be thinking outside of the box. This book is an incredibly important contribution to the literature. Joan Stevenson, Western Washington University.

6: Evolutionary Medicine and Health : Wenda R. Trevathan :

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7: Table of contents for Evolutionary medicine and health

Table of Contents for Evolutionary medicine and health: new perspectives / [edited by] Wenda R. Trevathan, E.O. Smith, James J. McKenna, available from the Library of Congress. Bibliographic record and links to related information available from the Library of Congress catalog.

8: Biology - Wikipedia

Evolutionary Medicine and Health: New Perspectives features an introductory overview that covers the field's diverse array of topics, questions, lines of evidence, and perspectives. In addition, the editors provide introductions to each essay and an extensive bibliography that represents a state-of-the-art survey of the literature.

9: Evolutionary Medicine and Health - Wenda R Trevathan - HÃ¤ftad () | Bokus

/ Cynthia M. Beall -- Evolution and modern behavioral problems: the case of addiction / Daniel H. Lende -- After dark: the evolutionary ecology of human sleep / Carol M. Worthman -- Evolutionary medicine and obesity: developmental adaptive responses in human body composition / Jack Baker.

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