

I'm not a robot





























2000).Indeed, related self-organizing phenomena pervade biology(Camazine et al. 2001). Such phenomena are seen not only in cells andorganisms, but in ecosystems, which reinforces the notion that broader systems perspective is needed as part of the new physics(Ulanowicz 1997). Important to such phenomena are the dynamics ofnon-linear interactions (where responses of a system to a stimulus) and autocatalytic cycles (reactions whose products are themselves and in which a larger quantity of one or more starting materials is made through the processes). Given that catalysts in biological systems are coded in the genes of DNA, oneplace to start defining life is to view living systems as informed,autocatalytic cyclic entities that develop and evolve under the dualdictates of the second law of thermodynamics and of natural selection(Depew & Weber 1995; Weber & Depew 1996). Such an approachnaturally connects the phenomena of living systems with basiclaws of physics and chemistry (Harold 2001). Others intuut that aeven richer physics is needed to adequately capture these self-organizing phenomena observed in biology and speculate that afourth law of thermodynamics about such phenomena mayultimately be needed (Kauffman 1993, 1995, 2000). In any event,increasingly the tools developed for the sciences ofcomplexity and being deployed to develop better models ofliving systems (Depew & Weber 1995; Kauffman 2000). Robert Rosenhas reminded us that complexity is not life itself but what he termsthe habit of life and that we need to make our focus on the relational. Organization inherently involves functionsand their interrelations (Rosen 1991, 280). Whether theexisting sciences of complexity are sufficient or a newer conceptualframework is needed remains to be seen (Harold 2001). Living beingsexhibit complex, functional organization and an ability to become moreadapted to their environments over generational time, which phenomeneresent the challenge to physically-based explanations based uponmechanistic (reductionistic) assumptions. By appealing to complexsystems dynamics there is the possibility of physically-based theoristhat can robustly address phenomena of emergence without havingrecourse to the type of vitalism that was countenancedby one in the earlier part of the twentieth century. 5. Origin (Emergence) of Life One of the biggest and most important of emergent phenomena is that ofthe origin or emergence of life. Franklin Harold ranks the mystery oflife's origin as the most consequential facing science today (Harold2001, 235). Michael Ruse claims that it is essential to incorporateorigin of life research into Darwinism since it is a necessarycondition for a scientifically and philosophically adequate definition of life (Ruse 2009, 101). Robert Rosen argued that the reason thatthe question of life's origin is so hard to answer is thatwe really want to know much more than what it is, we want to know whyit is, we are really asking, in physical terms, why a specificmaterial system is an organism and not something else (Rosen1991, 15). To answer this why question we need to understand how lifemight have arisen. While not attracting the attention nor levels ofunding of molecular biology, there was a continuous research programduring much of the twentieth century on the origin of life (forhistorical summaries see Fry 2000; Lahav 1999). During the 1920s Alexander Oparin and J.B.S. Haldane independentlyproposed the first modern hypotheses as to how life might haveoriginated on earth (Oparin 1929; Haldane 1929/1967). Keyassumptions were that the geophysical conditions on the primitive earthwere quite different from the present, most importantly there wouldhave been no molecular oxygen in the atmosphere (oxygen arising verymuch later in time with the appearance of photosynthetic organisms thatused light energy to split water) and that in this chemically reducingatmosphere an increasingly complex soup or organicmolecules would arise from which the precursors of living systems couldsurvive (for a recent discussion about the early atmosphere see Miyakawaet al. 2002). In effect this type of approach can be termed metabolism-first view. After the demonstration that some amino acids could be produced bythe action of an electrical discharge through a mixture of gasesthus to be present in the primitive atmosphere (Miller 1953),another possible starting point for the sequence to living things wasconsidered, namely proteins, the polymers of amino acids formed underconditions of high temperature (Fox & Harada 1958). Thisprotein-first view suggested that the chemistry that led to life couldhave occurred in a sequestered environment (globos of proteins) thatmight also have some weak catalytic activity that would havefacilitated the production of the other molecular components needed(Fox 1988). With the understanding of the structure of DNA focus shifted to theabiogenic routes to nucleic acids, which could serve then serve as templates for their own replication. Although Dawkins assumed a nucleicacid, formed by chance, would be the start of life since it wouldself replicate (Dawkins 1976), many approaches to gettingnucleic acids involve the use of minerals to help form scaffolds thatserve as sorts of ordering templates and even as catalysts for nucleic acid formation (Cairns-Smith 1982; see summary in Lahav 1999). Thediscovery that RNA is capable of some catalytic activity has led to thehypothesis of not only a nucleic acids first but more generally of anRNA world (Gilbert 1986). Variants of this approachrepresent the dominant mode of thinking about the early phases of theemergence of life (Maynard Smith and Szathmari 1995). Given that some type of metabolism would be needed to sustain RNA replication, a numberof approaches blend replication-first with metabolism-first (Dyson1982, 1999; de Duve 1995; Eigen 1992). An alternative view, congenial to a thermodynamic and systems approachto the emergence of life, takes the above more a step further andemphasizes the need the presence of the main factors that distinguishcells from non-cells: metabolism via autocatalytic cycles of catalyticpolymers, replication, and a physical enclosure within a chemicalbarrier like that provided by the cell membrane. This might be termeda proto-cell-first approach (Morowitz 1992; Weber 1998; Williams &Frausto da Silva 2002, 2003). Chemical constraints and these self-organizing tendencies of complex chemical systems in such a viewwould have been critical in determining the properties of the firstliving beings. (Kauffman 1993, 1995, 2000; Williams & Frausto daSilva 1999, 2002, 2003; Weber 2007, 2009). With the emergence of thefirst entities that could be termed living would come the emergence ofbiological selection or natural selection in which contingency plays amuch greater part. Darwin famously bracketed the question of the origin of life in freemotions of descent with modification through natural selection.Indeed, Darwinian theories of evolution can take living systems as given and then explore how novelties arise through a combination ofchance and necessity. However, an understanding of how life might haveemerged would provide a bridge between our view of the properties ofliving systems and the evolutionary phenomena they exhibit. Such anunderstanding ultimately is needed to anchor living systems in matterand the laws of nature (Harold 2001, 235). This remains a challenge tobe met in order for science to provide a more full answer to the question of the origin of life. 6. The emergence of life in a larger conceptual context of any possibleforms of life (Langton 1989, 1995). Work in A-Life shifts our focus onto processes in living things rather than the material constituents of their structures per se (Emmeche 1994). In some ways this is a revivalof the process thinking of the Cambridge biochemists of the 1930s, but involves a level of abstraction about the material structures thatinstantiate these processes that they would not have shared. However, such studies emphasize the organizational relationship betweencomponents rather than the components themselves, an important focus inthe emerging age of proteomics in which, in the posthuman genome era, the complex, functional interactions of the largearray of cellular proteins is being studied (Kumar & Snyder 2002). A-Life studies can help us to sharpen our ideas about whatdistinguishes living from non-living and contribute to our definition of life. Such work can help delineate the degree of importance of thetypical list of attributes of living entities, such as reproduction,metabolism, functional organization, growth, responsiveness to theenvironment, movement, and short- and long-term adaptations. A-Life work can also allow exploration about which features of life are due to the constraints of being embedded in a particular manner and subjectto physical and chemical laws, as well as exploring a variety ofactors that might affect evolutionary scenarios (Etxeberria 2002). Forexample, the relative potential roles of selection andself-organization in the emergence of novel traits in evolutionary timemight be evaluated by A-Life research. It is too soon yet to know howimportant the contribution of the A-Life program will be, but it islikely to become more prominent in the discourse on the origin andnature of life. 7. Conclusions Our increased understanding of the physical-chemical basis of living systems has increased enormously over the past century and it is possible to give a plausible definition of life in these terms.Living organisms are autopoietic systems: self-constructing, self-maintaining, energy-transducing autocatalytic entities inwhich information needed to construct the next generation of organisms is stabilized in nucleic acids that replicate within the context ofwhole cells and work with other developmental resources during their life-cycles of organisms, but they are also systems capable ofevolving by variation and natural selection; self-reproducingentities, whose forms and functions are adapted to their environment and reflect the composition and history of an ecosystem (Harold2001, 232). Such a perspective represents a fulfillment of the basicinsights of Schrdinger near mid-century. Much remains to be elucidated about the relationships among the complex molecular systems of living entities, how they are constrained by the system as a wholeas well as by physical laws. Indeed, it is still an open question forsome as to whether we have yet a sufficiently rich understanding of the laws of nature or whether we need to seek deep laws that lead toorder and organization (Kauffman 2000). At the start of the newcentury there is a sense of the importance of puttingSchrdinger's program into a systems context ( seefor example Rosen 1991, 2000; Kauffman 1993, 1995, 2000; Depew andWeber 1995; Weber & Depew 1996, 2001; Ulanowicz 1997, 2001;Williams and Frausto da Silva 1999; 2002, 2003; Harold 2001; Morowitz2002; Bunge 2003; Macdonald and Macdonald 2010). Significant challenges remain, such as fully integrating our new view of organismsand their action with evolutionary theory, and to understand plausibilities for the emergence of life. The fulfillment of such a program will give us a good sense of what life is on earth. Work in A-Life andempirical work seeking evidence of extra-terrestrial life may help theformation of a more universal concept of life. Science Biology life, living matter and, as such, matter that shows certain attributes that include responsiveness, growth, metabolism, energy transformation, and reproduction. Although a noun, as with other defined entities, the word life might be better cast as a verb to reflect its essential status as a process. Life comprises individuals, living beings, assignable to groups (taxa). Each individual is composed of one or more minimal living units, called cells, and is capable of transformation of carbon-based and other compounds (metabolism), growth, and participation in reproductive acts. Life-forms present on Earth today have evolved from ancient common ancestors through the generation of hereditary variation and natural selection. Although some studies state that life may have begun as early as 4.1 billion years ago, it can be traced to fossils dated to 3.53.7 billion years ago, which is still only slightly younger than Earth, which gravitationally accreted into a planet about 4.5 billion years ago. But this is life as a whole. More than 99.9 percent of species that have ever lived are extinct. The several branches of science that reveal the common historical, functional, and chemical basis of the evolution of all life include electron microscopy, genetics, paleobiology (including paleontology), and molecular biology. The phenomenon of life can be approached in several ways: life as it is known and studied on planet Earth; life imaginable in principle; and life, by hypothesis, that might exist elsewhere in the universe (see extraterrestrial life). As far as is known, life exists only on Earth. Most life-forms reside in a thin sphere that extends about 23 km (14 miles) from 3 km (2 miles) beneath the bottom of the ocean to the top of the troposphere (lower atmosphere); the relative thickness is comparable to a coat of paint on a rubber ball. An estimated 1030 million distinguishable species currently inhabit this sphere of life, or biosphere.reef frogRed perch on a lily.Much is known about life from points of view reflected in the various biological, or life, sciences. These include anatomy (the study of form at the visible level), ultrastructure (the study of form at the microscopic level), physiology (the study of function), molecular biology and biochemistry (the study of form and function at chemical levels), ecology (the study of the relations of organisms with their environments), taxonomy (the naming, identifying, and classifying of organisms), ethology (the study of animal behaviour), and sociobiology (the study of social behaviour). Specific sciences that participate in the study of life focus more narrowly on certain taxa or levels of observation.g., botany (the study of plants), lichenology (the study of lichens, leafy or crusty individuals composed of permanent associations between algae or photosynthetic bacteria and fungi), herpetology (the study of amphibians and reptiles), microbiology (the study of bacteria, yeast, and other unicellular fungi, archaea, protists, viruses), zoology (the study of marine and land animals), and cytology (the study of cells). Although the scientists, technicians, and others who participate in studies of life easily distinguish living matter from inert or dead matter, none can give a completely inclusive, concise definition of life itself. Part of the problem is that the core properties of life: growth, change, reproduction, active resistance to external perturbation, and evolutioninvolve transformation or the capacity for transformation. Living processes are thus antithetical to a desire for tidy classification or final definition. To take one example, the number of chemical elements involved with life has increased with time; an exhaustive list of the material constituents of life would therefore be premature. Nonetheless, most scientists implicitly use one or more of the metabolic, physiological, biochemical, genetic, thermodynamic, and autopoietic definitions given below.Metabolic definitions are popular with biochemists and some biologists. Living systems are objects with definite boundaries, continually exchanging some materials with their surroundings but without altering their general properties, at least over some period of time. However, there are exceptions. There are frozen seeds and spores that remain, so far as is known, perfectly dormant. At low temperatures they lack metabolic activity for hundreds, perhaps thousands, of years but revive perfectly well upon being subjected to more clement conditions. A candle flame has a well-defined shape with a fixed boundary and is maintained by metabolizing its organic waxes and the surrounding molecular oxygen to produce carbon dioxide and water. Similar reactions, incidentally, occur in animals and plants. Flames also have a well-known capacity for growth. These facts underscore the inadequacy of this metabolic definition, even as they suggest the indispensable role of energy transformation to living systems. (See metabolism.)Venus flytrapActive traps of the Venus flytrap (Dionaea muscipula), a carnivorous plant. If depressed at least twice, thin pressure-sensitive hairs in the trap stimulate the lobes to clamp tightly over an insect. Physiological definitions of life: Life is defined as any system capable of performing functions such as eating, metabolizing, excreting, breathing, moving, growing, reproducing, and responding to external stimuli. But many such properties are either present in machines that nobody is willing to call alive or absent from organisms, such as the dormant hard-covered seed of a tree, that everybody is willing to call alive. An automobile, for example, can be said to eat, metabolize, excrete, breathe, move, and be responsive to external stimuli. A visitor from another planet, judging from the enormous number of automobiles on Earth and the way in which cities and landscapes have been designed for the special benefit of motorcars, might well believe that automobiles are not only alive but are the dominant life-form on the planet. (See physiology.) Facts You Should Know: The Human Body Quiz A biochemical or molecular biological definition sees living organisms as systems that contain reproducible hereditary information coded in nucleic acid molecules and that metabolize by controlling the rate of chemical reactions using the proteinaceous catalysts known as enzymes. In many respects, this is more satisfying than the physiological or metabolic definitions of life. However, even here there are counterexamples. Viruslike agents called prions lack nucleic acids, although the nucleic acids of the animal cells in which they reside may be involved in their reproduction. Ribonucleic acid (RNA) molecules may replicate, mutate, and then replicate their mutations in test tubes, although by themselves they are not alive. Furthermore, a definition strictly in chemical terms seems peculiarly vulnerable. It implies that, were a person able to construct a system that had all the functional properties of life, it would still not be alive if it lacked the molecules that earthly biologists are fond ofand made of. (See biochemistry.) Science Biology timeline of life on EarthOver hundreds of millions of years, life spread through the seas and over Earth's surface. The first life-forms were small and simple. Later forms were more complicated and diverse. The existence of diverse definitions of life, as detailed in the previous section, surely means that life is complex and difficult to briefly define. A scientific understanding of living systems has existed since the second half of the 19th century. But the diversity of definitions and lack of consensus among professionals suggest something else as well. As detailed in this section, all organisms on Earth are extremely closely related, despite superficial differences. The fundamental pattern, both in form and in matter, of all life on Earth is essentially identical. Also, as noted in this section, this identity implies that all organisms on Earth are evolved from a single instance of the origin of life. To generalize from a single example is difficult, especially when the example itself is changing, growing, and evolving. In this respect the biologist is fundamentally handicapped, as compared with, say, the chemist, physicist, geologist, or meteorologist, each of whom can now study aspects of his discipline beyond Earth. If truly only one sort of life on Earth exists, then perspective is lacking in a most fundamental way. On the other hand, the historical continuity of all life-forms means that ancient life, perhaps even the origins of life, may be glimpsed by studying modern cells.Their planet Earth.Reconnaissance missions to the planets of the inner solar system have revealed stark and barren landscapes. From the heavily cratered and atmosphereless surfaces of both Mercury and the Moon to the hot sulfurous fogs of Venus and the dusty, windswept surface of Mars, no sign of life is apparent anywhere. The biosphere, by definition the place where all Earths life dwells, is a delight with its green, wet contrast. Austrian geologist Eduard Suess invented the term biosphere to match the other envelopes of the planet: the atmosphere of gas; the hydrosphere of oceans, lakes, rivers, springs and other waters; and the lithosphere, or the solid rock surface of the outer portion of Earth. Yet it was the great Russian crystallographer and mineralogist Vladimir I. Vernadsky who brought the term into common parlance with his book of the same name. In The Biosphere (1926) Vernadsky outlines his view of life as a major geological force. Living matter, Vernadsky contends, erodes, levels, transports, and chemically transforms surface rocks, minerals, and other features of Earth. If the biosphere is the place where life is found, the biota (or the biomass as a whole) is the sum of all living forms: flora, fauna, and microbiota.During the second half of the 20th century, study of the deep sea, the upper atmosphere, the Antarctic dry deserts, newly opened caves, sulfurous tunnels, and granitic rocks showed that Earths surface is vigorously inhabited in places that were unknown to Vernadsky and his colleagues. Vernadsky's internal model of thought ushered in the field of biogeochemistry, and chemists and geologists were recruited to consider life as a planetary phenomenon. But not until giant, mouthless, red-gilled tube worms were discovered in the late 1970s and 80s did the extent and weirdness of Earths biota begin to be fathomed. Entire large ecosystems were recognized on the oceans bottom that live not by the usual plant photosynthesis but rather by chemolithoautotrophy, a kind of metabolism in which organisms make food from carbon dioxide using energy from the oxidation of sulfide, methane, or other inorganic compounds. These discoveries have led to a deeper understanding of lifes varied modes of nutrition and sources of energy. Bacterial symbionts living in the tissues of some polychaete worms (alvinellids) or pogonophora (such as Riftia pacytilis) provide the animals with their total nutritional needs. The submarine ecosystems supported by bacteria thrive along the worldwide rift zones that extend along the borders of huge continental plates at the Mid-Atlantic Ridge, on the East Pacific Rise, and at 21 north of the Equator off the coast of Baja California, Mex., and at a dozen other newly studied sites. By the beginning of the 21st century it had become abundantly clear that many life-forms and ecosystems remained unknown or under-studied. Those in the Siberian tundra, in the thickly forested portions of the Amazon River valley and its tributaries, at the tops of remote mountains and inside granitic rocks in temperate zones, and in the centre of Africa remain as inaccessible to most naturalists as they have been throughout history. The easily accessed woodlands and fields of well-lit land surfaces are another story.On land, 24 percent of the productivity of organic carbon biomass generated by plants is directly controlled by burgeoning populations of one species, humans. As Vernadsky noted, life in general and human life in particular tend to accelerate the number of materials and the rate of flow of these materials through the biosphere, the place where all life existsso far.Vernadsky anticipated new discoveries of life inside hot springs and granitic rock. Although he qualified this statement by asserting that it would not hold for temporary, abnormal circumstances, such as during a lava flow or a volcanic eruption, he wrote, Facts You Should Know: The Human Body Quiz Thus far, we have seen that the biosphere, by structure, composition, and physical makeup, is completely enclosed by the domain of life, which has so adapted itself to biospheric conditions that there is no place [on Earth] in which it is unable to manifest itself in one way or another.Although much is not known about life in the depths of the rocks and the sea, determination of the total range and mass (biomass) of the biota, the sum of all life in the biosphere, is a reasonable scientific goal.animal cellPrincipal structures of an animal cellCytoplasm surrounds the cell's specialized structures, or organelles. Ribosomes, the sites of protein synthesis, are found free in the cytoplasm or attached to the endoplasmic reticulum, through which materials are transported throughout the cell. Energy needed by the cell is released by the mitochondria. The Golgi complex, stacks of flattened sacs, processes and packages materials to be released from the cell in secretory vesicles. Digestive enzymes are contained in lysosomes. Peroxisomes contain enzymes that detoxify dangerous substances. The centrosome contains the centrioles, which play a role in cell division. The microvilli are fingerlike extensions found on certain cells. Cilia, hairlike structures that extend from the surface of many cells, can create movement of surrounding fluid. The nuclear envelope, a double membrane surrounding the nucleus, contains pores that control the movement of substances into and out of the nucleoplasm. Chromatin, a combination of DNA and proteins that coil into chromosomes, makes up much of the nucleoplasm. The dense nucleolus is the site of ribosome production.Human beings, like mammals in general, are ambulatory collections of some 1014 cells. Human cells are all in fundamental respects the same as those that make up the other animals. Each cell typically consists of one central, spherical nucleus and another heterogeneous region, the cytoplasm. (Only bacterial cells lack nuclei; those of plants, fungi, and all other organisms contain one or more nuclei.) A living nucleated cell, a marvel of detailed and complex architecture, appears frenetic with activity when seen through a microscope. On a deeper chemical level, it is known that lifes large molecules, the proteins and nucleic acids, are synthesized at a very fast rate. Enzymes, which speed up chemical reactions, are all proteins, but by no means are all proteins enzymes. An enzyme catalyzes the synthesis of more than 1,000 other molecules per second. The total mass of a metabolizing bacterial cell can be synthesized in 20 minutes. The information content of a small cell has been estimated as about 1010 bits, comparable to about 106 (or one million) pages of the print orientation that explains the phenomena of life only in terms of external principles of chemistry and physics. Although it cannot be pinpointed exactly, evidence suggests that life on Earth has existed for about 3.7 billion years.[1] Biological characteristics of lifeLiving organisms share many universal characteristics, including that they are composed of cells, pass on their heredity using a nearly universal genetic code; need energy from the environment to exist, grow, and reproduce; and maintain their internal environment, among others. These are the common set of characteristics identified by biologists that distinguish living organisms from nonliving things. Non-living entities may exhibit some of these characteristics, but not all of them.Cells. With the exception of viruses, all organisms consist of cells. A cell is the basic unit of life, being the smallest unit that can carry on all the processes of life, including maintenance, growth, and even self-repair. Some simple life forms, such as the paramecium, consist of a single cell throughout their life cycle and are called unicellular organisms. Multicellular organisms, such as a whale or tree, may have trillions of cells, and have differentiated cells that perform specialized functions.Carbon-based biochemistry. Living organisms are characterized by a common carbon-based biochemistry. All organisms pass on their heredity via the genetic material that is based upon nucleic acids, such as DNA, using a nearly universal genetic code. Every cell, no matter how simple or complex, utilizes nucleic acids for transmitting and storing the information needed for manufacturing proteins.Complex organization. Living organisms are complex and organized, both at the molecular and cellular levels. The energy and materials from the environment are organized, such as the internal structure of a cell, or the organization of multicellular organisms into tissues, organs, and systems. Nonliving things may be complex, but the organization in living things is much more complex. In essence, living organisms, utilizing energy from without, reverse entropy. Whereas the general tendency is for non-living entities to lose energy and tend toward disorder, or to exist in order only due to such external forces as gravitation or electro-magnetic forces, living organisms process energy and use it to exist in states of complex order.Energy and metabolism. Every living being needs energy from the environment in order to exist, grow, and reproduce. Living things require energy to maintain internal organization (homeostasis) and to produce the other phenomena associated with life, such as movement and work. The sun is the main source of energy and is captured through a process of photosynthesis, a process by which plants, algae, and some bacteria harness the energy of sunlight to produce food. Ultimately, nearly all living things depend on energy produced from photosynthesis for their nourishment, making it vital to life on Earth. There are also some bacteria that utilize the oxidation of inorganic compounds such as hydrogen sulfide or ferrous iron as an energy source. An organism that produces organic compounds from carbon dioxide as a carbon source, using either light or reactions of inorganic chemical compounds as a source of energy, is called an autotroph. Other organisms do not make their own food but depend directly or indirectly on autotrophs for their food. These are called heterotrophs. Metabolism is the biochemical modification of chemical compounds, including converting nonliving material into complex organic molecules (synthesis) and decomposing organic matter (catalysis), yielding energy-carrying molecules and essential building-block molecules.Development and growth. Living things grow and develop as they age. This involves maintenance of a higher rate of synthesis than catalysis, with growth of the organism taking place through cell enlargement and cell division. A growing organism increases in size in all of its parts, rather than simply accumulating matter. In most metazoan organisms, the basic steps of the early embryo development share similar morphological stages and include similar genes.Homeostasis. All living organisms, whether unicellular or multicellular, exhibit homeostasis. Homeostasis is the property of an open system to regulate its internal environment so as to maintain a stable condition. Homeostasis can manifest itself at the cellular level through the maintenance of a stable internal acidity (pH); at the organismal level, warm-blooded animals maintain a constant internal body temperature, and at the level of the ecosystem, for example when atmospheric carbon dioxide levels rise, plants are theoretically able to grow healthier and thus remove more carbon dioxide from the atmosphere. Tissues and organs can also maintain homeostasis.Response to stimuli. All living organisms respond to the environment. A response to stimuli can take many forms, from the contraction of a unicellular organism when touched to complex reactions involving all the senses of higher animals. A response is often expressed by motion, for example, the leaves of a plant turning toward the sun or an animal chasing its prey. A cockroach may respond to light by running for a dark place. When there is a complex set of response, it is called a behavior. For example, the migration of salmon is a behavioral response.Adaptation. Living organisms have characteristics that give them a survival/reproductive advantage in an environment, that is, they have adaptations to the environment. Living organisms show variability in these adaptations, allowing the species to continue in a fluctuating or changing environment.Reproduction. Reproduction is the ability to produce new organisms. Reproduction can be the division of one cell to form two new cells. Usually the term is applied to the production of a new individual (either asexually, from a single parent organism, or sexually, from at least two differing parent organisms), although strictly speaking it also describes the production of new cells in the process of growth. Sexual reproduction is a trait that is almost universal, if not universal, among living beings. Asexual reproduction is not uncommon. In fact, it is widespread among fungi and bacteria, many insects reproduce in this manner, and some reptiles and amphibians. Nonetheless, sexual reproduction is also seen in these same organisms, including in bacteria which will exchange genetic material between donors (+ mating type) and recipients (- mating type). Evolutionary biologist and geneticist John Maynard Smith maintained that the perceived advantage for an individual organism to pass only its own entire genome to its offspring is so great that there must an advantage by at least a factor of two to explain why nearly all animal species maintain a male sex.It is important to note that reproduction as a characteristic applies primarily at the level of species, so even though many individuals of any given species do not reproduce, possibly because they belong to specialized sterile castes (such as ant workers) or are sterile for other reasons, including age or disease, these are still considered forms of life. Likewise one could see that the property of life is inherited; hence, sterile hybrid species such as the mule are considered life although not themselves capable of reproduction. For similar reasons, viruses and aberrant prion proteins are often considered replicators rather than forms of life, a distinction warranted because they cannot reproduce without very specialized substrates such as host cells or proteins, respectively. However, most forms of life rely on foods produced by other species, or at least the specific chemistry of Earth's environment.Philosophical characteristic of lifeIn addition to the above, generally recognized biological characteristics, some philosophers recognize another quality that comprises living organisms.10. Life-factor. This additional characteristic is an immaterial, inner aspect that distinguishes living organisms, such as plants and animals, from inanimate objects, such as atoms, molecules, and minerals. This quality or characteristic of "life" is an invisible, non-material force that underlies the physical, and Aristotle calls it the "soul" (psyche). According to Aristotle, every existing thing is composite of "form" (its essence or whattness) and "matter" (the material stuff it is made of), and form and matter are inseparable from each other (hylomorphism). The "form" of a living thing, whether it is a plant or an animal, is the soul, while its "matter" is the body. Life is none other than the soul of a living thing, which is the ability to engage, through the soul, in the activities that are characteristic of living things in the worldactivities such as self-nourishment, growth, reproduction, locomotion, perception, and intellect. While the plant soul can only engage in self-nourishment, growth, and reproduction, the animal soul can engage in locomotion and perception as well as in the activities of the plant soul. The human soul can engage not only in all these activities but also in intellect.Aristotle, perhaps the very first biologist in the West, understands the soul (life) to be always inseparable from the body, and this notion of the soul is very different from our modern understanding of it as something immortal beyond physical life. If this Aristotelian view is applied, the DNA and proteins of a cell may only be the external or physical aspect of lifethe base of life or the part that carries life, and there is an immaterial "life field" that guides the DNA. By analogy, the chemistry and structures of a cell is like a radio while life is like the radio waves that give meaning to its sound, or the structures of a cell forms the computer while the life-force is like the software that runs on the computer to do meaningful tasks. The life-factor has the quality of mind; it carries the qualities of consciousness. In process philosophy, the internal aspect of living organisms is regarded as a subset of the two qualities that living organisms share with all existent beings, the quality of dual characteristics or polarity. Alfred North Whitehead (1861-1947) calls it the "dipolarity" of reality, which means that every actual entity in the universe has two distinguishable yet inseparable poles: mental and physical. Both Aristotle and Whitehead find the dual characteristics of form and matter (Aristotle) or of mental and physical poles (Whitehead) in nonliving beings as well. For them, however, living beings have a higher degree of the development of the internal than nonliving beings, thus having activities of life. Another school relevant to this discussion is vitalism, according to which living organisms possess a non-physical inner force such as the "entelechy" of Hans Driesch (1867/1941) and the "lan vital" of Henri Bergson (1874-1948), to which the biological activities of living organisms can be ascribed. Vitalism is opposed to biological mechanism which maintains that phenomena of life can be explained exclusively in terms of chemistry and physics that deal with matter.Origin of lifeMain article: Origin of life The Grand Prismatic Spring of Yellowstone National ParkThere is no truly "standard" model for the origin of life, but most currently accepted scientific models build in one way or another on the following discoveries, which are listed roughly in order of postulated emergence:Plausible pre-biotic conditions result in the creation of the basic small molecules of life.Phospholipids spontaneously form lipid bilayers, the basic structure of a cell membrane.Procedures for producing random RNA molecules can produce ribozymes, which are able to produce more of themselves under very specific conditions.There are many different hypotheses regarding the path that might have been taken from simple organic molecules to protocells and metabolism. Many models fall into the "genes-first" category or the "metabolism-first" category, but a recent trend is the emergence of hybrid models that do not fit into either of these categories.From a philosophical or religious perspective, the external manifestation of the development of life was guided at every stage of the process by the internal life-force, and ultimately by the Supreme Being or Creator.Main articles: Extraterrestrial lifeEarth is the only planet in the universe known to harbor life. The Drake equation has been used to estimate the probability of life elsewhere, but scientists disagree on many of the values of variables in this equation. Depending on those values, the equation may either suggest that life arises frequently or infrequently.Notes Origin of lifeGaea hypothesis Durrant, Michael, ed. 1993. Aristotle's De Anima in Focus. London: Routledge. ISBN 0415053404Margulis, L., and D. Sagan. 1995. What is Life? Simon & Schuster. ISBN 0684810875Schrodinger, E. 2000. 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- http://greenplanetnepal.com/userfiles/file/22414741422.pdf
- http://pwr-tech.ru/userfiles/file/powawumapov.pdf
- kumapa
- fedex express uniform policy
- what are the five tips to develop critical thinking skills