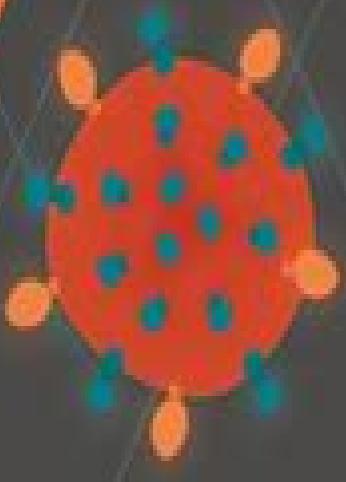


The World of Viruses and its Evolution

Eugene V. Koonin

Evolutionary Genomics Group Leader
at the National Center for Biotechnology Information
at the NIH, Bethesda, USA

online, 20 Sept, 7 PM



Online Book Evolution Virus World Eugene Koonin

Sabine Zange

Online Book Evolution Virus World Eugene Koonin:

Microbial genomics challenge Darwin Didier Raoult, Eugene V. Koonin, The 200th anniversary of Darwin's birthday was celebrated in 2009 making the concept of Darwinism even more popular than at the time it was originally proposed to the extent that it has acquired quasi religious status His theory revolves around a Tree of Life in which all living organisms are considered to have descended from a single ancestor and each node represents a common ancestor It comprises hierarchy and dichotomy which are typical characteristics of the post biblical 19th century vision Indeed according to post modern philosophy also called the French theory the majority of theories including scientific ones are based only on meta narratives expressing the influence of a culture at a given time Buddhism or Hinduism may have generated a very different story of evolution Our way of thinking about life and the way we describe evolution have changed radically in the 21st century due to the genomic revolution Comparative genome analyses have demonstrated that gene repertoires are characterized by plasticity and there is strong evidence that nearly all genes have been exchanged at some point Genomic data show that the genetic information of living organisms is inherited not only vertically but also laterally Lateral gene transfers were at first observed only in bacteria which contain genes originating from eukaryotes Archaea and viruses Such transfers were subsequently identified in all living organisms giant viruses have chimeric genomes and the human genome is a mosaic of genes with eukaryotic bacterial and viral origins We cannot identify a single common ancestor for the gene repertoire of any organism Furthermore a very high proportion of genes have been newly created through gene fusion or degradation and others show no homology to sequences found in other species It is now clear that every living organism has a variety of ancestors while exchanges between species are intense and the creation of new genes is frequent and permanent in all living organisms Our current genomic knowledge contradicts the tree of life theory as established by Darwin Recent analyses have produced bushes rather than resolved trees with the structure of some parts remaining elusive It becomes more and more obvious that phylogenetic relationships are better described by forests and networks and that species evolution looks more like a rhizome The chimerism and mosaic structure of all living organisms through both non vertical inheritance and de novo creation can only be assimilated and described by a post Darwinist concept In this Research Topic we wish to highlight the influence of microbiology and genomics on our understanding of the complexity of gene repertoires and also demonstrate how current knowledge does not support Darwin's theory Microbiology has offered a great advance in the way we perceive life Evidence obtained from studies on bacterial and viral evolution lateral inheritance phylogenetic trees and biodiversity continues to challenge what constituted until recently an unimpeded dogma in biology **The Logic of Chance** Eugene V. Koonin, 2011-06-23 The Logic of Chance offers a reappraisal and a new synthesis of theories concepts and hypotheses on the key aspects of the evolution of life on earth in light of comparative genomics and systems biology The author presents many specific examples from systems and comparative genomic analysis to begin to build a new much more

detailed complex and realistic picture of evolution The book examines a broad range of topics in evolutionary biology including the inadequacy of natural selection and adaptation as the only or even the main mode of evolution the key role of horizontal gene transfer in evolution and the consequent overhaul of the Tree of Life concept the central underappreciated evolutionary importance of viruses the origin of eukaryotes as a result of endosymbiosis the concomitant origin of cells and viruses on the primordial earth universal dependences between genomic and molecular phenomic variables and the evolving landscape of constraints that shape the evolution of genomes and molecular phenomes Koonin's account of viral and pre-eukaryotic evolution is undoubtedly up to date His mega views of evolution given what was said above and his cosmological musings on the other hand are interesting reading Summing Up Recommended Reprinted with permission from CHOICE copyright by the American Library Association *COVID-19 Pandemic, Geospatial Information, and Community Resilience* Abbas Rajabifard, Daniel Paez, Greg Foliente, 2021-06-07 The Open Access version of this book available at <https://www.taylorfrancis.com/books/oa/edit/10/1201/9781003181590> has been made available under a Creative Commons Attribution Non Commercial No Derivatives 4.0 license Geospatial information plays an important role in managing location dependent pandemic situations across different communities and domains Geospatial information and technologies are particularly critical to strengthening urban and rural resilience where economic agricultural and various social sectors all intersect Examining the United Nations SDGs from a geospatial lens will ensure that the challenges are addressed for all populations in different locations This book with worldwide contributions focused on COVID 19 pandemic provides interdisciplinary analysis and multi sectoral expertise on the use of geospatial information and location intelligence to support community resilience and authorities to manage pandemics *COVID-19 Pandemic – Philosophical Approaches* Nicolae Sfetcu, 2020 The paper begins with a retrospective of the debates on the origin of life the virus or the cell The virus needs a cell for replication instead the cell is a more evolved form on the evolutionary scale of life In addition the study of viruses raises pressing conceptual and philosophical questions about their nature their classification and their place in the biological world The subject of pandemics is approached starting from the existentialism of Albert Camus and Sartre the replacement of the exclusion ritual with the disciplinary mechanism of Michel Foucault and about the Gaia hypothesis developed by James Lovelock and supported in the current pandemic by Bruno Latour The social dimensions of pandemics their connection to global warming which has led to an increase in infectious diseases and the deforestation of large areas which have caused viruses to migrate from their native area their reservoir are highlighted below The ethics of pandemics is approached from several philosophical points of view of which the most important in a crisis of such global dimensions is utilitarianism which involves maximizing benefits for society in direct conflict with the usual Kantian view of respect for people as individuals After a retrospective of the COVID 19 virus that caused the current pandemic its life cycle and its history with an emphasis on the philosophy of death the concept of biopower initially developed by Foucault is discussed with reference to the practice

of modern states of control of the populations and the debate generated by Giorgio Agamben who states that what is manifested in this pandemic is the growing tendency to use the state of emergency as a normal paradigm of government An interesting and much debated approach is the one generated by the works of Slavoj i ek who states that the current pandemic has led to the bankruptcy of the current barbaric capitalism wondering if the path that humanity will take is a neo communism Another important negative effect is desocialization with the conclusion of some philosophers that we cannot exist independently of our relationships with others that a person s humanity depends on the humanity of those around him The last section is dedicated to forecasting what the world will look like after the pandemic and there are already signs of a paradigm shift including the sudden disappearance of the wall ideology a cough was enough to make it suddenly impossible to avoid the responsibility that every individual has it towards all living beings for the simple fact that he is part of this world and of the desire to be part of it The whole is always involved in part because everything is in a sense in everything and in nature there are no autonomous regions that are an exception The COVID 19 pandemic seems to restore the supremacy that once belonged to politics One of the virtues of the virus is its ability to generate a more sober idea of freedom to be free means to do what needs to be done in a specific situation

CONTENTS Abstract Introduction 1 Viruses 1 1 Ontology 2 Pandemics 2 1 Social dimensions 2 2 Ethics 3 COVID 19 3 1 Biopolitics 3 2 Neocommunist 3 3 Desocialising 4 Forecasting Bibliography DOI 10 13140 RG 2 2 31039 74405 1  (David Quammen), 2022-07-07 2018 DNA CRISPR *FUNDAMENTALS OF PLANT PATHOLOGY* N. G. RAVICHANDRA, 2013-04-22 This book is based on the syllabus prescribed by the Indian Council of Agricultural Research New Delhi for the first and second year undergraduate students of plant pathology in State Agricultural and Horticultural Universities and hence is of special importance to these students The text conveniently divided into 13 chapters deals with fundamental aspects of plant pathology viz scope and objectives importance of plant diseases history and development of plant pathology theory of plant diseases causes of plant diseases biotic abiotic and plant viruses with representative examples symptoms general characteristics of plant pathogens classification of phytopathogens growth and reproduction of plant pathogens including replication of plant viruses liberation or dispersal of plant pathogens their survival and types of parasitism and variability in plant pathogens At the end of each chapter important questions have been provided for the benefit of the students Diagrams convincing tables and suitable graphs illustrations are furnished at appropriate places A complete bibliography and apt subject index are appended at the end Besides undergraduate students this book will also serve as a basic guide to meet the requirement of teachers researchers in plant pathology and related fields [L'albero intricato](#) David Quammen, 2020-05-28T00:00:00+02:00 A guidare la mano di Darwin mentre nel 1837 tracciava in un taccuino il primo schizzo del suo albero della vita c era l idea della discendenza delle specie da un antenato comune Idea audace che andava contro il dogma creazionista e stabiliva una continuit tra gli esseri umani e creature ben pi primitive nella scala della natura Da allora l albero filogenetico nelle sue

molteplici incarnazioni non ha fatto che espandersi incontrando tuttavia un limite nell'impossibilità di esplorare adeguatamente il vasto mondo degli organismi microscopici. Negli anni Settanta grazie al suo lavoro su batteri e archei con tecniche avanzate di filogenetica molecolare Carl Woese ha mostrato che l'albero della vita è più intricato di quanto si immaginasse e forse non neppure un albero. Un dubbio che divenuto certezza quando si è scoperto che i geni non si spostano solo in senso verticale da una generazione alla successiva ma anche lateralmente e che possono attraversare i confini di specie o passare da un regno a un altro. Noi stessi siamo un mosaico di forme di vita: l'otto per cento del genoma umano consiste infatti di residui di retrovirus che hanno invaso il DNA dei nostri antenati. L'equivalente genetico di una trasfusione di sangue. E tra i donatori ci sono organismi primordiali che dominavano la scena della vita miliardi di anni fa e ora abitano in ciascuno di noi in una simbiosi che solleva interrogativi inquietanti sul concetto stesso di specie e di individuo. Con mano sicura Quammen ci guida nei meandri della scienza che negli ultimi decenni ha cercato di far luce sul mistero dei rapporti filogenetici fra tutti gli esseri che popolano la Terra, restituendoci una galleria di ritratti un albero di storie che rimarrà impresso a lungo nella mente del lettore.

Books in Print, 1994 **Scientific and Technical Books and Serials in Print**, 1989 *Comparative Genomics and Evolution of Complex Viruses* V. Dolja, E. Koonin, 2006

Origin and Evolution of Viruses Esteban Domingo, Colin R. Parrish, John J. Holland, 2008-06-23

New viral diseases are emerging continuously. Viruses adapt to new environments at astounding rates. Genetic variability of viruses jeopardizes vaccine efficacy. For many viruses mutants resistant to antiviral agents or host immune responses arise readily, for example with HIV and influenza. These variations are all of utmost importance for human and animal health as they have prevented us from controlling these epidemic pathogens. This book focuses on the mechanisms that viruses use to evolve, survive and cause disease in their hosts. Covering human, animal, plant and bacterial viruses, it provides both the basic foundations for the evolutionary dynamics of viruses and specific examples of emerging diseases. NEW methods to establish relationships among viruses and the mechanisms that affect virus evolution. UNIQUE combines theoretical concepts in evolution with detailed analyses of the evolution of important virus groups. SPECIFIC Bacterial, plant, animal and human viruses are compared regarding their interaction with their hosts.

The Evolution of the Virus World ASM Press, Eugene V. Koonin, Valerian Dolja, 2013-10-15

In 1926-27 the Soviet Central Statistical Administration initiated several yearlong expeditions to gather primary data on the whereabouts, economy and living conditions of all rural peoples living in the Arctic and sub-Arctic at the end of the Russian civil war. Due partly to the enthusiasm of local geographers and ethnographers, the Polar Census grew into a massive ethnological exercise gathering not only basic demographic and economic data on every household but also a rich archive of photographs, maps, kinship charts, narrative transcripts and museum artifacts. To this day it remains one of the most comprehensive surveys of a rural population anywhere. The contributors to this volume all noted scholars in their region have conducted long term fieldwork with the descendants of the people surveyed in 1926-27. This volume is the culmination of

eight years work with the primary record cards and was supported by a number of national scholarly funding agencies in the UK Canada and Norway It is a unique historical ethnographical analysis and of immense value to scholars familiar with these communities contemporary cultural dynamics and legacy

Molecular Evolution of Viruses – Past and Present

Yechiel Becker,2011-09-27 The studies presented in this special issue of VIRUS GENES provide information on the two aspects of virus evolution the ancient evolution of viruses from the time prokaryotic and eukaryotic cells evolved and the ongoing process of the current molecular evolution of viruses The studies of many scientists collected in this issue and many more that were published in other scientific journals provide insight into the molecular evolution of viruses as one of nature's mysteries The use of computer programs to study the nucleotide sequences of viral genomes the amino acid compositions of proteins coded by viral genomes and searches for regulatory mechanisms in viral nucleic acid replication as well as identities of motifs in proteins of viruses from all families will provide additional information on the subject In future issues that will be devoted to this subject the origin and evolution of RNA and DNA viruses will be further investigated

Viruses

Marilyn J. Roossinck,2023-05-02 A comprehensive and richly illustrated introduction to the world of viruses As parasites that are often hundreds of times smaller than bacteria viruses exist in and on everything everywhere Rapidly evolving they are highly opportunistic and relentlessly efficient While some viruses are obviously agents of disease as the COVID 19 pandemic has reminded the world only too well others can be beneficial helping to protect their hosts from other microbes or allowing hosts to function in otherwise impossible ways In *Viruses* virus expert and author Marilyn Roossinck presents a comprehensive and richly illustrated introduction to viruses that reveals their true nature Using lively text clear graphics and beautiful imagery *Viruses* examines all the aspects of viruses that are essential for understanding them their diversity behaviors life cycles and much more Written in a nontechnical and easy to follow style the book covers what viruses are and where they come from how they transmit and evolve the battle between viruses and hosts including immunity and vaccination viruses that are good for us the critical role viruses play in the balance of earth's ecosystems what makes a virus including COVID 19 and influenza become pandemic in plants or animals and the cutting edge research that is discovering thousands of new viruses Each chapter concludes with stunningly illustrated profiles that highlight key viruses In a world where understanding viruses is more important than ever *Viruses* offers a rich and inviting introduction to organisms that for all the harm they can do are also essential for the health of animals plants and the world we share

A Planet of Viruses

Carl Zimmer,2011-09-15 Viruses are the smallest living things known to science yet they hold the entire planet in their sway We are most familiar with the viruses that give us colds or the flu but viruses also cause a vast range of other diseases including one disorder that makes people sprout branch like growths as if they were trees Viruses have been a part of our lives for so long in fact that we are actually part virus the human genome contains more DNA from viruses than our own genes Meanwhile scientists are discovering viruses everywhere they look in the soil in the ocean even in caves miles

underground This fascinating book explores the hidden world of viruses a world that we all inhabit Here Carl Zimmer popular science writer and author of Discover magazine s award winning blog The Loom presents the latest research on how viruses hold sway over our lives and our biosphere how viruses helped give rise to the first life forms how viruses are producing new diseases how we can harness viruses for our own ends and how viruses will continue to control our fate for years to come In this eye opening tour of the frontiers of biology where scientists are expanding our understanding of life as we know it we learn that some treatments for the common cold do more harm than good that the world s oceans are home to an astonishing number of viruses and that the evolution of HIV is now in overdrive spawning more mutated strains than we care to imagine The New York Times Book Review calls Carl Zimmer as fine a science essayist as we have A Planet of Viruses is sure to please his many fans and further enhance his reputation as one of America s most respected and admired science journalists

Viruses and the Evolution of Life Luis P. Villarreal,2005 Viruses and the Evolution of Life is an intriguing presentation of the virus host relationship as revealed through an examination of host evolution This new volume avails the informed reader of a new perspective on the evolution of life while targeting the expert reader with discussions of specific scientific literature Addresses the adaptation and evolution of viruses and more importantly the role of viruses in evolutionary biology Develops integrated themes for study of virology Contributes valuable information to the understanding of the virus host relationship Integrates the relationship between genetic parasites found in host genomes with the virology of the host Communicates basic principles to the informed reader while presenting a scholarly evaluation of literature to challenge the specialist Written by one of the foremost experts in the field *Molecular Evolution of Viruses — Past and Present* Yechiel Becker,Gholamreza Darai,2000-11-30 second gene is the endoplasmic reticulum ER elements SINEs The repetitive DNA sequences in resident heat shock protein GRP78 a member of the eukaryotic genomes are thought to reflect the Bip family The identification of an ER resident evolutionary forces acting on selfish DNA 10 It GRP78 protein in G lamblia a primitive eukaryotic may be possible to suggest that the Archeabacterial archazoan that lacks mitochondria and other retrons 6 further evolved by recruiting essential organelles strongly suggests the existence of ER in cellular genes into RNA and DNA viruses this ancient eukaryote Phylogenetic analyzes of In a recent review on mitochondrial evolution 21 HSP70 sequences showed that the cytoplasmic and Gray et al indicated that gene sequence data suggest ER homolog form distinct subfamilies that evolved that the mitochondrion arose in a common ancestor from a common eukaryotic ancestor by gene of all extant eukaryotes raising the possibility that this duplication that occurred very early in the evolution organelle originated at essentially the same time as the of eukaryotic cells 18 In a more detailed analysis nuclear component of the eukaryotic cell

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