I Contain Multitudes: The Microbes Within Us and a Grander View of Life

Ed Yong
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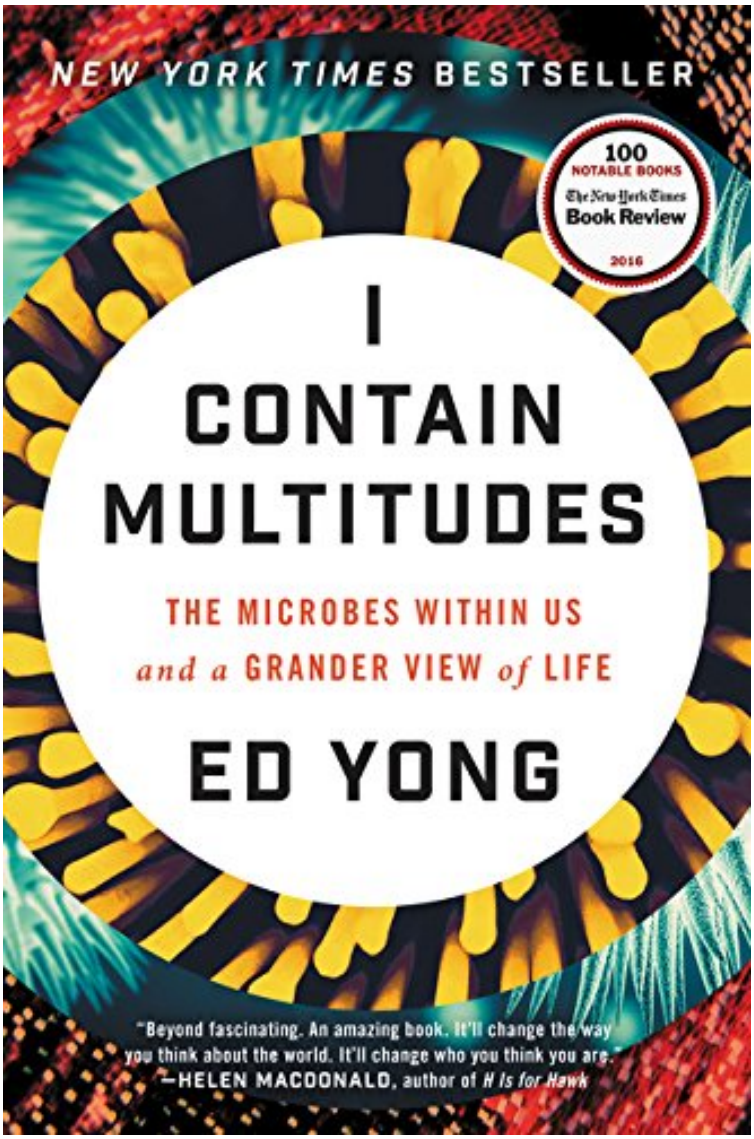

#4890 in Books Ed Yong 2016-08-09 2016-08-09Original language:EnglishPDF # 1 9.00 x 1.18 x 6.00l, .0 #File Name: 0062368591368 pagesI Contain Multitudes The Microbes Within Us and a Grander View of Life | File size: 71.Mb

Ed Yong : I Contain Multitudes: The Microbes Within Us and a Grander View of Life before purchasing it in order to gage whether or not it would be worth my time, and all praised I Contain Multitudes: The Microbes Within Us and a Grander View of Life:

82 of 84 people found the following review helpful. Accessible and important, but ponderousBy CustomerWith the

growing Zika and Dengue threats, understanding how microbes and their hosts interact is vital. Not everyone can make it through this long and detailed account, but it is worth the effort. We will all face questions that are addressed in this book - - from whether to pay extra for heavily advertised probiotics to whether or not to support the release of wolbachia-infected mosquitoes in our own backyards to stop the spread of deadly diseases.Without requiring specialist knowledge or vocabulary, the author introduces the complex concepts behind the recent revolution in understanding of microbes' role in health, evolution, ecology, and culture.A few years ago, before I retired from a medical practice in non-tropical Minneapolis, I had a patient whose unusual rash was probably caused by an African parasitic worm that hosts a bacterium which allows the worm to live inside its human host. By chance, I had just seen an article on treating his condition by giving antibiotics to eliminate the bacterium, thus allowing the patient's immune system to kill the worms. In an increasingly globalized world, the more people acquire the background to be able to absorb information like that and recall it when it becomes relevant, the better.Fortunately, the reader is rewarded with tidbits of levity along the way - - the name of a product aimed at restoring healthy digestive system microbes, for instance: "rePOOPulate."There's no cheerleading for every trendy "natural" "probiotic" cure under the sun. Nature is revealed as indifferent to our personal goals - - and capable of producing undesired results when we try to tamper with it. What we find here instead is a very balanced look at what has been learned and tried, what has worked and what has failed, and where we may be going.142 of 153 people found the following review helpful. Portrait of the human as an entangled bankBy Ashutosh S. JogalekarIts time we became friends with microbes. And not just with them but with their very idea, because its likely going to be crucial to our lives on this planet and beyond. For a long time most humans have regarded bacteria as a nuisance. This is because we become aware of them only when something goes wrong, only when they cause diseases like tuberculosis and diarrhea. But as Ed Yong reveals in this sweeping, exciting tour of biology, ecology and medicine which is pregnant with possibility, the vast majority of microbes help us in ways which we cannot possibly fathom, which permeate not just our existence but that of every single other life form on our planet. The knowledge that this microbial universe is uncovering holds tantalizing clues to treating diseases, changing how we eat and live and potentially effecting a philosophical upheaval in our view of our relationship with each other and with the rest of life.Yongs book shines in three ways. Firstly its not just a book about the much heralded microbiome the densely populated and ubiquitous universe of bacteria which lives on and within us and which rivals our cells in terms of numbers but its about the much larger universe of microbes in all its guises. Yong dispels many misconceptions, such as the blanket statements that bacteria are good or bad for us, or that antibiotics are always good or bad for us. His narrative sweeps over vast landscape, from the role of bacteria in the origins of life to their key functions in helping animals bond on the savannah, to new therapies that could emerge from understanding their roles in diseases like allergies and IBD. One fascinating subject which I think Yong could have touched on is the potential role of microbes in seeding extraterrestrial life.The universal theme threading through the book is symbiosis: how bacteria and all other life forms function together, mostly peacefully but sometimes in a hostile manner. The first complex cell likely evolved when a primitive life form swallowed an ancient bacterium, and since this seminal event life on earth has never been the same. They are involved in literally every imaginable life process: gut bacteria break down food in mammals stomachs, nitrogen fixing bacteria construct the basic building blocks of life, others play critical roles in the water, carbon and oxygen cycle. Some enable insects, aphids and a variety of other animals to wage chemical warfare, yet others keep coral reefs fresh and stable. Theres even a species that can cause a sex change in wasps. Perhaps the most important ones are those which break down environmental chemicals as well as food into myriad interesting and far-ranging molecules affecting everything, from mate-finding to distinguishing friends from foes to nurturing babies immune systems through their ability to break down sugars in mothers milk. This critical role that bacterial symbiosis plays in human disease, health and even behavior is probably the most fascinating aspect of human-bacteria co-existence, and one which is only now being gradually teased out. Yongs central message is that the reason bacteria are so fully integrated into living beings is simple: we evolved in a sweltering, ubiquitous pool of them that was present and evolving billions of years before we arrived on the scene. Our relationship with them is thus complex and multifaceted, and as Yong demonstrates, has been forged through billions of years of messy and haphazard evolution. For one thing, this therefore makes any kind of simple generalization about them almost certainly false. And it makes us realize how humanity would rapidly become extinct in a world suddenly devoid of microbes.Secondly, Yong is adept at painting vivid portraits of the men and women who are unraveling the secrets of the microbial universe. Old pioneers like Pasteur, Leeuwenhoek and Koch come alive in crisp portraits (for longer ones, I would recommend Paul DeKruif's captivating classic, "Microbe Hunters"). At the same time, new pioneers herald new visions. Yong crisscrosses the globe, from the San Diego Zoo to the coral reefs of Australia to the savannah, talking to adventurous researchers about wasps, aphids, hyenas, squid, pangolins, spiders, human infants and all the microbes that are intimately sharing their genes with these life forms. He is also a sure guide to the latest technology including gene sequencing that has revolutionized our understanding of these fascinating creatures (although I would have appreciated a longer discussion on the so-called CRISPR genetic technology that has recently taken the world by storm). Yongs narrative makes it clear that innovative ideas come from the best researchers combining their acumen with the best technology. At the same time his sometimes-wondrous narrative is tempered

with caution, and he makes it clear that the true implications of the findings emerging from the microbiome will take years and perhaps decades to unravel. The good news is that we're just getting started.Thirdly, Yong delves deeply into the fascinating functions of bacteria in health and disease, and this involves diseases which go way beyond the familiar pandemics that have bedeviled humanity throughout its history. Antibiotics, antibiotic resistance and the marvelous process of horizontal gene transfer that allows bacteria to rapidly share genes and evolve all get a nod. Yong also leads us through the reasonable but still debated 'hygiene hypothesis' which lays blame for an increased prevalence of allergies and autoimmune disorders at the feet of overly and deliberately clean environments and suburban living. He discusses the novel practice of fecal transplants that promises to cure serious intestinal inflammation and ailments like IBD and Crohns disease, but is also wary about its unpredictable and unknown consequences. He also talks about the fascinating role that bacteria in newborn infants bodies play when they digest crucial sugars in mothers milk and affect multiple functions of the developing babys body and brain. Unlike proteins and nucleic acids, sugars have been the poor cousins of biochemistry for a long time, and their key role in microbial symbiosis only highlights their importance for life. Finally and most tantalizingly, the book describes potential impacts that the bodys microbiome and its outside guests might have on animal and human behavior itself, leading to potential breakthrough treatments in psychiatry. The real implications of these roles will have to be unraveled through the patient, thoroughgoing process that is the mainstay of science, but there is little doubt that the arrows seem to be pointing in very promising directions.There is grandeur in this view of life, Darwin said in his magnum opus The Origin of Species. And just how much grandeur there exactly is becomes apparent with the realization that Darwin was dimly aware at best of microbes and their seminal role in the origin and propagation of life. Darwin saw life as an 'entangled bank' full of wondrous species: I can only imagine that he would have been enthralled and stupefied by the vision of this entangled bank presented in Ed Yong's book.4 of 4 people found the following review helpful. LOVE!By Kiana PoI Contain Multitudes by Ed Yong explains in 355 pages the amazing benefit that microbes have on earth and in us. This 2016 non-fiction novel informs his readers about the world of microbes and the symbiotic relations they have with their host through a variety of examples as the author dives into the world of microbes. Ed Yong is an award winning science writer that breaks down this new small world in easy to digest layman examples to educate readers the importance of these small organisms with their host. He has traveled to many institutions and spoke the experts of various fields in the world of microbiology to understand the tremendous impact that microbes have. He mainly goes into the world of animals and their relationship with microbes, but he wonderfully connects these examples to help us understand the future of probiotics and disease in humans.As Yong goes into his examples, it is clear that the microbial world is in a delicate balance with our reality. Although he does focuses on animal, mainly humans and their relationship with microbes, he does points out that Jack Gilbert and Josh Neufeld stated if plants were dont have any microbes, they surely will fail and can lead to societal collapse because there food chain would fail. Plants depends on microbes to fix nitrogen or give it key nutrients to help the plants flourish. This example he uses early on in the book really set the tone for the rest of the examples and how far a single microbe influence can have a snowball effect on us.Ed starts the readers journey with Baba, a pangolin at the San Diego Zoo with Babas keeper swabbing the Babas body to understand his microbiome. Ed lays out the foundation to the rest of the book by explaining basic key terms and concepts of the diversity of microbes on the body. As the book progress, Ed goes into the importance of microbes to humans. He states that if animals were sterile, free of any microbes, they would die. For example, if sap-sucking bugs lack their bacteria in their gut, they would parish because they wouldnt be able to get all the nutrients they need without those important bacteria.Like Baba, humans have their own unique microbiome throughout their body, like the how the skin microflora differs from the gut microflora. This diversity on the human body is so interesting, that even the microflora of the right hand would be different than the microflora of the left hand. This diversity is also unique from person to person.The journey of a human obtaining their own unique microbiome starts at birth. In the womb, the fetus is completely sterile, but during birth, the baby obtains its first microbes can be traced back to their mom. He does goes into how the differences of birthing method, vaginal and cesarean section affects a childs first microbes. These microbes can affect the childs immune responses in the future. Even having a pet or an older sibling in the development of a child can may reduce the possibility of allergies of the child as a result of constant exposure at a young age to a variety of microbes from diverse locations. This trains the immune system at an early age to help fight infections later in life.It is emphasized that a mother is the biggest player in shaping the childs microbiome. Not just from the birthing method, but also the role of breast milk. Yong divulges in the amazing properties of break milk for babies on how it plays a huge role on a babies gut microbiota. Breast milk is one of humans first prebiotic for a baby, since it not only nourishes and protect the immune system of the baby, but provides nutrients to the childs first set of bacteria, L. infantilis in their gut.Yong even states that the gut microbiome can also affect behavior. He starts his example with lab mice, and if pregnant mother with infection during pregnancy, it can have healthy offspring that can have behavioral abnormalities in adulthood such as repetitive behaviors and social aversion, which is similar to the humans conditions of autism and schizophrenia. When looking at the gut microbiota diversity of a mice with such quirks to a normal mouse, there is a difference in the variety, even when everything is the same, such as environment and nutrition.This behavior in mice is relates to behavior in autistic individuals, although it is stated that mice dont

have autism since autism, according to Emily Willingham, is shaped by society and what seems to be normal. When gut microbes from autistic children were transplanted into the gut of healthy mice, the mices behavior did change by repetitive burying of a marble and low frequency of squeaks, which could be related to autistic behaviors of children. Yong mentions that that the gut microbe are partially responsible for such behaviors in autistic children, but it cannot be the sole reason.Fascinatingly, germ free mice that lacked a gut microbiome had behavior differences of their normal microbiota counterpart, these mice were more timid. When introduced to the bacteria commonly found in yoghurt and dairy products, Lactobacillus rhamnosus, specifically the strain JB-1 to their gut, the mice were able to overcome anxiety through the same tests that were made to test psychiatric drugs. Apparently, the strain JB-1 acted like a low dose of anti-anxiety and antidepressants, according to Cyan from the University of Cork. The researched looked into the brains of the mice of JB-1 and showed that brains response to GABA changed with the strain. The suspected that the nerve that that carries signal from the brain to gut aided JB-1 in the influence of the improved behavior in the mice. Yong informs reader of current research that correlated the behavior to the gut microbiota, demonstrated that there is more than meets the eye of the microflora animals.Not only does the book go into detail of the symbiosis humans and their microbes, it proved examples of how microorganisms help with survival of the host, like the illuminating Vibrio fischeri and the Hawaiian bobtail squid. When the Hawaiian bobtail squid hatches from their egg, it is born without V. fischeri. Interestingly enough, the bobtail squid has immature crypts which houses these bacteria. When V. fischeri goes to colonize the squid. Once these bacteria colonize the squid, it start to mature the remaining organs to help it survive in their environment. It take more than just a few of the V. fischeri to help the Hawaiian bobtail squid survive. Once the bacteria reached a certain threshold of one turn on their bioluminescent to hide the bobtail squids shadow in the water and also produce antimicrobial properties to it can reduce competition by making it impossible for other microbes to occupy the bobtail. In exchange for helping the bobtail squid V. fischeri gains protection and a constant supply of nutrients.The symbiosis of a microorganism and its host can be an indicator of the health of the host and environment, such as dying coral reefs on Christmas Island. The dying reefs are a prime example of a delicate balance of the symbiosis of microbes, because a reason for these reefs to dye is algae. The rise of algae is a result of the disruption of the food chain, such as the decrease of sharks. Sharks host an abundance of algae, if they are gone, the algae population stays in the water as wells are the production of dissolved organic carbon. This dissolved organic carbon will allow the microbe populations toe exponentially increase; therefore, consuming all the surrounding oxygen, essentially chocking the corals.Usually there are 10 percent of the local microbe species in coral are pathogenic and cause disease because the normal coral microflora keeps the population of microbes in check. Around Christmas Island it is around 50 percent because of the abundance of nutrients from the algae. As coral die, it makes room for more of this algae to grow, which leads to a never ending cycle of dying coral and flourishing microbial community and algae.As Yong enlightens readers of the benefit of microbes in the world, he leads us to microbes place in medical field. Like his previous example of the how microbes can affect behavior, he leads us to thinking about the potential uses of microbes in treating diseases or maximizing the effect of medicine. For example, digoxin has been used to treat patients with hearts that are failing, but it the patients has Eggerthella lenta in their gut microbiome, digoxin will not work because the bacteria converts the drug into an inactive form. This isnt the only drug and microbe pair that affect treatment. Yong brings up fecal transplant or a more refined and cleaner version to be the future of treatments, not just in behavior but in all sorts of treatments to help reduce symptoms or treat disease. Even brings up that inside the hospital is riddling with a high concentrations pathogenic microbes, but if a window is just opened to allow the outside microbes to come in and occupy space in the hospital. These outside microbes in the environment will push out and decrease the pathogenic microbial population.Readers do not need to come from a science background to read and thoroughly understand this book, because Ed Yong wonderfully explains the purpose of each example and how it correlated back the balance of a delicate symbiosis of the microbe and its host. This book is amazing to for readers of all backgrounds, but I would recommend this book to mothers, physicians and health fanatics since Ed Yong displays the importance of microbes to the positive health of the human body and the environment. A disruption of microbes can cause huge impact on the host or environment, which can allow us to pinpoint the cause of the disruption. Microbes and their effects are great indicator of the health of where it is occupying. Essentially, microbes are not as evil as we have been taught to think.The issue with Ed Yongs book is the fact he didnt mention quorum sensing one in the book, because that would help the reader understand how microbes effect their own population or the community they live with. Also, Ed Yong jumped around a lot in examples, I felt like he could have separated examples by relevance. Personally, I would have started his examples with the symbiosis of the bugs then to talk about the corals the impact of environments. Then use antibiotic resistance as a transition from animals to humans, then go into behaviors affected by microbes. He could have concluded with fecal matter transplant and using microbes as treatments and then ended with the research of tracking a buildings, new or old microbiome.It took until the end to understand the purpose of this book, because Yong starts out with going on this adventure to understand the world of microbes without giving a reason. It later chapters, everything comes together on why this subject is important. The future of medicine and treatments could possibly lie in the hands of the microscopic organisms. Even understanding the environmental health can be indicated by the concentration or shift in diversity of

microbes. He mentions that probiotics would be uniquely prescribed to patients with a nutrient regime to either enhance to effectiveness of medicine or to be the medicine itself to help with certain symptoms or diseases. Over all, Ed Yong did an amazing job on informing readers on the world of microbes in a way that a variety of backgrounds could understand.

New York Times BestsellerNew York Times Notable Book of 2016NPR Great Read of 2016Economist Best Books of 2016Brain Pickings Best Science Books of 2016Smithsonian Best Books about Science of 2016Science Friday Best Science Book of 2016A Mother Jones Notable Read of 2016A Bill Gates Gates Notes PickMPR Best Books of 2016Chicago Public Library Best of the Best Books of 2016 Minnesota Star-Tribune Best of the YearA Kirkus Best Book of the YearA PW Best Book of the Year Guardian Best of the YearTimes (London) Best of the YearJoining the ranks of popular science classics like The Botany of Desire and The Selfish Gene, a groundbreaking, wondrously informative, and vastly entertaining examination of the most significant revolution in biology since Darwina microbes-eye view of the world that reveals a marvelous, radically reconceived picture of life on earth.Every animal, whether human, squid, or wasp, is home to millions of bacteria and other microbes. Ed Yong, whose humor is as evident as his erudition, prompts us to look at ourselves and our animal companions in a new lightless as individuals and more as the interconnected, interdependent multitudes we assuredly are.The microbes in our bodies are part of our immune systems and protect us from disease. In the deep oceans, mysterious creatures without mouths or guts depend on microbes for all their energy. Bacteria provide squid with invisibility cloaks, help beetles to bring down forests, and allow worms to cause diseases that afflict millions of people.Many people think of microbes as germs to be eradicated, but those that live with usthe microbiomebuild our bodies, protect our health, shape our identities, and grant us incredible abilities. In this astonishing book, Ed Yong takes us on a grand tour through our microbial partners, and introduces us to the scientists on the front lines of discovery. It will change both our view of nature and our sense of where we belong in it.

In I Contain Multitudes, Yong synthesizes literally hundreds and hundreds of papers, but he never overwhelms you with the science. He just keeps imparting one surprising, fascinating insight after the next. I Contain Multitudes is science journalism at its best. (Bill Gates)[An] excellent and vivid introduction to our microbiota. . . . infectiously enthusiastic. (New York Times Book)A science journalists first book is an excellent, vivid introduction to the all-enveloping realm of our secret sharers. (New York Times Book , Editor's Choice)Offer[s] engrossing-and gross-details about how an invisible world shapes our speciesMr. Yongs book lives up to its title, containing multitudes of facts presented in graceful, accessible prose.The author wonderfully turns to the humanities again and again to enrich the books scientific detailAnd hes funny. (Wall Street Journal)Not since de Kruifs classic, Microbe Hunters, has this invisible world been brought so vividly to life Yongs curiosity and humor made me smile and even laugh out loud, much to my husbands surprise. By the end of the book his sense of wonder for microbes was, well, infectious. (Boston Globe)For a lesser writer, the temptation to oversimplify the science or to sex up unwarranted conclusions might have proved irresistible. Mr Yong expertly avoids these pitfalls. I Contain Multitudes bowls along wonderfully without it. His hero, Sir David [Attenborough], would surely approve. (The Economist)Beautifully written. . . . Yong - who like Carl Zimmer belongs to the highest tier of science journalists at work today - weaves revelatory anecdotes and cutting-edge reporting into an elegant, illuminating page-turner. (Minneapolis Star Tribune)Beautiful, smart, and sometimes shocking. (Wired)Masterful . . . a tale that shifts our personal cosmology and compels us to look anew at the world (The Guardian)A delightful, witty book. Yong vividly describes the intricate alliances forged by microbes with every other organism on the planet (Science)[Yongs] enthusiasm and wonder are propulsive. While [he] acknowledges that the questions outnumber the answers in this relatively nascent field, he thrills to the potential inherent in what scientists have already learned about microbes astonishing powers. As a result, so do we. (The Week)The strong narrative, rigorous reporting and fluid writing make I Contain Multitudes one of the most essential science books of the year. Yongs wit, and endearing inability to pass up an opportunity for wordplay, are just a couple of the many bonuses that make it enjoyable, too. (Philly Voice)Fascinating and elegantly written. . . . Yong peels the veneer of the visible to reveal the astonishing complexity of life thriving beneath and within the crude confines of our perception. . . . masterful [and] intensely interesting. (Brainpickings)An exceptionally informative, beautifully written book that will profoundly shift ones sense of self to that of symbiotic multitudes. (Kirkus, Starred)[A] informative and infectiously readable book. (Cell)Bottom line: dont hate or fear the microbial world within you. Appreciate its wonders. After all, they are more than half of you. (Booklist, Starred)Yong makes a superb case for his position by interviewing numerous scientists and presenting their fascinating work in an accessible and persuasive fashion. (Publishers Weekly, Starred)Readable and entertaining. . . . Highly recommended for general science readers interested in the complicated relationships between microbes and their hosts. (Library Journal)Yong writes like Sagan did, with humor and a deep understanding of science. The incredible partnerships these microbes have with all of us, the weird facts that enlighten our knowledge, our own view of nature: they all will change once we understand these partnerships better. (GeekDad)Ed Yongs I Contain Multitudes is wonderful. Deeply strange, true, funny, beautifully written. (William

Gibson)Ed Yong is one of our finest young explainers of science-wicked smart, broadly informed, sly, savvy, so illuminating. And this is an encyclopedia of fascinations-a teeming intellectual ecosystem, a keen book on the intricacies of the microbiome and more. (David Quammen, author of Spillover)I Contain Multitudes changes you the way all great science writing does. You become disoriented, looking at the world around you in a new way. With vivid tales and graceful explanations, Ed Yong reveals how the living things we see around us are wildly complex collectives. (Carl Zimmer, author of Parasite Rex)Beyond fascinating. An amazing book. Itll change the way you think about the world. Itll change who you think you are. (Helen Macdonald, author of H Is for Hawk)Ed Yong has written a riveting account of the microbes that make the world work. I Contain Multitudes will change the way you look at yourselfand just about everything else. (Elizabeth Kolbert, author of The Sixth Extinction)This compelling and beautifully written book will change the way people look at the world around, and within, them. Certainly among the best books in an increasingly crowded field and written with a true passion for and understanding of the microbiome. (Rob Knight, author of Follow Your Gut and professor at University of California, San Diego)Yong has captured the essence of this exciting field, expressing the enthusiasm and wonder that the scientific community feels when working with the microbiome. (Professor Jack Gilbert, University of Chicago)A marvelous book! Ed Yongs brilliant gift for storytelling and precise writing about science converge in I Contain Multitudes to make the invisible and tiny both visible and mighty. A unique, entertaining, and smart read. (Jeff VanderMeer, author of the Southern Reach Trilogy)A must-read for the curious and science-minded, Yongs book helps guide us through this exciting landscape. (Bookpage)From the Back CoverA groundbreaking, marvelously informative microbes-eye view of the world that reveals a radically reconceived picture of life on earth.For most of human existence, microbes were hidden, visible only through the illnesses they caused. When they finally surfaced in biological studies, they were cast as rogues. Only recently have they immigrated from the neglected fringes of biology to its center. Even today, many people think of microbes as germs to be eradicated, but those that live with usthe microbiomeare invaluable parts of our lives. I Contain Multitudes lets us peer into that world for the first time, allowing us to see how ubiquitous and vital microbes are: they sculpt our organs, defend us from disease, break down our food, educate our immune systems, guide our behavior, bombard our genomes with their genes, and grant us incredible abilities. While much of the prevailing discussion around the microbiome has focused on its implications for human health, Yong broadens this focus to the entire animal kingdom, giving us a grander view of life. With humor and erudition, Ed Yong prompts us to look at ourselves and our fellow animals in a new light: less as individuals and more as the interconnected, interdependent multitudes we assuredly are. When we look at the animal kingdom through a microbial lens, even the most familiar parts of our lives take on a striking new air. We learn the secret, invisible, and wondrous biology behind the corals that construct mighty reefs, the glowing squid that can help us understand the bacteria in our own guts, the beetles that bring down forests, the disease-fighting mosquitoes engineered in Australia, and the ingredients in breast milk that evolved to nourish a babys first microbes. We see how humans are disrupting these partnerships and how scientists are now manipulating them to our advantage. We see, as William Blake wrote, the world in a grain of sand. I Contain Multitudes is the story of these extraordinary partnerships, between the familiar creatures of our world and those we never knew existed. It will change both our view of nature and our sense of where we belong in it.About the AuthorEd Yong is an award-winning science writer on the staff of the Atlantic. His blog Not Exactly Rocket Science is hosted by National Geographic, and his work has appeared in The New Yorker, Wired, the New York Times, Nature, New Scientist, Scientific American, the Guardian, the Times, Discover, Slate, and other publications. He lives in London and Washington DC.