

Ethical Obligations Towards Extraterrestrial Life*

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Were we to encounter alien life in Mars or Europa, or thousands of years from now in some exo-planet, we would face the question of what ethical obligations we may have towards such life. Indeed, the question already has urgency, since the search for extant or fossil life in Mars is only months away, and so will be, in a few years, the exploration of Europa for the very purpose of looking for alien life. A proper answer should take into account the different varieties of alien life we might encounter: microbial, complex multicellular, animal, and intelligent life. Any sort of alien life would be of extraordinary scientific importance. Studying alien life can teach us a great deal about terrestrial life, for it would allow us to make important comparisons that would tell us to what extent our chemistry is the result of accidents of organic evolution or based on fundamental biological processes. A very likely consequence would be a revolution in our understanding of our own biology. Even microbial life would thus have at the very least extraordinary instrumental value for humanity, and thus we would have a very strong obligation to preserve it, unless we discover that it poses a great threat to human survival. As the complexity of alien life rises to, say, plant or animal life (or close-enough equivalents), its scientific value becomes far higher, and so does the strength of our obligation to preserve it. The instrumental value of alien life would be so high as to render the question of whether it also has implicit value not very practical. Intelligent alien life would offer special ethical problems, for the morality of species is influenced by their biology, and intelligent aliens would be the result of a likely different basic biology, and of a definitely different evolutionary history. Nevertheless, we can still try to come to an ethical “understanding” with them, insofar as communication does not prove impossible, by following the advice given by Peter Singer in *The Expanding Circle*: namely that we cannot assume that our interests are more important than theirs just because they are ours, and vice versa, i.e. we have to take each other’s interests with impartiality.

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Introduction

Around the time these words appear in print, NASA and the European Space Agency will be launching a six-wheeled Mars rover, *Perseverance*, to look for signs of fossil life in the Jezero Crater, which is presumed to have held a lake and a river delta in ancient times. It is hoped that some rocks there will contain biosignatures such as the layered mats formed, on Earth, by photosynthetic cyanobacteria. Of course, finding living Martian organisms, most likely microorganisms is a possibility. And in a decade or so we might be exploring Jupiter’s moon Europa for the specific purpose of searching for extant life in the large ocean under the thick ice cover.

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Were we to find alien life, the consequences would be of extraordinary importance. In the first place, because such life has much to teach us about our own life. And this will in turn give rise to *prima facie* ethical obligations to preserve such life. Let us see why. All life on this planet is based on the same carbon chemistry and apparently all have the same genetic code. Of the many possible amino acids, only twenty are used to build proteins. DNA, the reproductive code for terrestrial life, makes use of only four bases. Moreover, organic molecules can be left handed or right handed, but terrestrial life prefers left-handed amino acids and right-handed sugars. Are these circumstances mere accidents of organic evolution, or are there fundamental reasons why life has taken these particular turns on this planet? Even *one* other kind of life would permit us to make great strides in examining these matters. For that other life may use a wider range of amino acids and bases, or it may prefer right-handed amino acids or left-handed sugars. One result of such a finding may be that, say, a particular chemical balance in the Earth's oceans caused the preference for left-handed amino acids. Or the alien life may be similar to life on Earth, which would reveal to us some sort of organic inevitability. The new perspective would be very fruitful in trying to understand our own biology at all levels.

It would be especially useful to observe stages of organic evolution and to study life as it begins in a new world, or at least to find fossil records of such beginnings. Beyond the stage of primitive cells, radically different alien forms of life would offer greater rewards. Even if perchance organic evolution produced in two similar planets similar primitive cells with essentially the same genetic code, the subsequent evolution would have much to teach us, for life in those two planets would undergo different histories of adaptation. Imagine, for example, that the now famous Alvarez asteroid had not crashed on the Earth. No one knows how dinosaurs would have continued to evolve, but it is possible that their grip on the surface of the planet would have been further strengthened. Mammals might have been thus forever condemned to crawl and scratch in the night like so many other vermin.

Even similar planets are likely to exhibit different tectonic histories. Plate tectonics brings continents together or breaks them apart; it throws chains of mountains up over the landscape; and it creates volcanoes where the plates rub against each other. In doing so it brings some habitats to an end and others into existence. It destroys. It influences. It changes life in many ways. Consider how the variation in the size of landmasses influences the fauna and flora of a planet. Certain large animals, for example, need a large environment in which they can roam for long distances. Elephants used to travel many hundreds of miles in their annual migrations. As these big mammals went along, they ate a variety of plants, thus insuring a balanced diet and permitting the vegetation at every feeding stop enough time to recuperate. Their considerable droppings were recycled, in the meantime, by armies of insects and bacteria. In a much smaller environment the vegetation would have been devastated, and the elephants would have suffered from poor diets and the unsanitary rot of their own excrement (Laws et al., 1975). They would not have been fit.

Slight differences at the beginning of the history of a planet would alter the make-up of the crossroads that life has to face, first at the level of organic chemistry, and then at the level of cells—presuming that cells are common to living things. A eukaryotic cell (a cell with a nucleus) may well be the result of symbiosis between different varieties of prokaryotic cells (without a nucleus). For example, the mitochondria in eukaryotic cells may be the remnants of prokaryotic cells that discovered how to use oxygen for energy and were swallowed but not digested by larger bacteria. Since eukaryotic cells are the building blocks of all complex organisms on Earth, we can imagine that different symbiotic relationships between primitive cells might have led to forms of life vastly different from those of our acquaintance (Bylinsky, 1981). On planets so endowed, the subsequent

interaction of life with the rest of the environment would have a multiplier effect, for they would change their environment in novel ways, and those new environments would lead life to adaptations that on Earth could meet only with misfortune.

Acquaintance with such alternative biotas would inevitably lead to profound transformations in the science of biology as it grows, for scientific knowledge seldom grows without changes. In this, scientific knowledge resembles animals. Mammals, for example, did not just get bigger after the extinction of the dinosaurs. As their size increased, the structure of their skeletons had to change to accommodate their larger weight. In a planet with gravity similar to ours, a dog the size of an elephant would probably look much like an elephant. In an analogous manner, a science of biology that were suddenly much larger in subject matter would have to grow connections and supporting structures for which there was little need in the days of a single biota. And, of course, advances in biology often lead to advances in medicine as well.

As we encounter possible life forms or fossils, many questions will come up that will be investigated in variety of ways. That natural scientific response is likely to lead to the growth of scientific knowledge, even if the scientific consensus is that no alien life has been found. Let us consider one example: David McKay's team's analysis of the Martian meteorite known as ALH84001 (1996). According to this analysis, the meteorite contains globules of carbonate, polycyclic aromatic hydrocarbons (PAHs), magnetite and iron sulfides, and some intriguing structures that some believed might be the fossils of ancient Martian bacteria (see Figure 1). We know that the meteorite, which was found in Antarctica, came from Mars because the air trapped inside exhibits the same mix of rare gasses that the Martian atmosphere has. Great care was taken to rule out the possibility that the organic materials found could be the result of contamination (indeed, the proportion of those materials increases towards the center of the meteorite). Nevertheless, the reaction to McKay's results, particularly by those scientists considered experts on meteorites, was extremely hostile (Kerr, 1996).

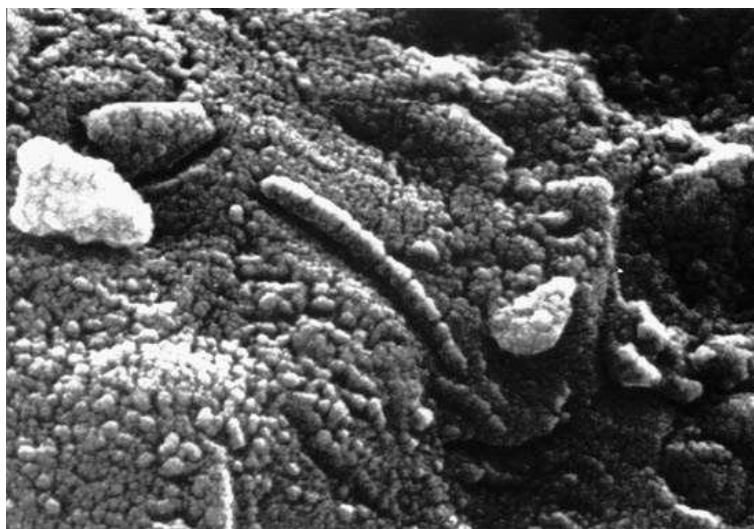


Figure 1. Worm-like features inside ALH84001. Courtesy of NASA.

The motivation for the hostility was in no small part the fear of ridicule, of having the study of meteorites branded as another “cold fusion,” the big scientific embarrassment of the previous decade. The main argument against McKay's analysis was based on Occam's razor, a principle named after William of Occam, the medieval philosopher who insisted that we should accept the simplest explanation available.

As it was often repeated during this debate, extraordinary claims require extraordinary evidence, but hydrocarbons, the magnetite and the minute worm-like features could be explained by ordinary inorganic processes. There is, then, no need to conclude that Martian life caused the phenomena found in the meteorite.

Occam's razor, however, does not rule against McKay's analysis. In ALH84001 he found a collection of three things in an extremely confined space (a few nanometers across): (1) typical bacterial food (hydrocarbons), (2) structures that look like typical bacteria, and (3) typical excreta of bacteria (magnetite and iron sulfides). One simple hypothesis, life, accounts for all these phenomena and the fact that they are closely packed together: Martian bugs ate the hydrocarbons and left the droppings behind. The inorganic-origins hypothesis requires at least three separate mechanisms and has little to say about why they are together in such a small space.

Moreover, inorganic magnetite forms at a temperature about three times higher than that apparently experienced by the Martian meteorite. And the magnetite in the sample, unlike that produced by inorganic processes, is of an extremely pure form, which on Earth is normally produced only by bacteria. It is far from obvious then that the inorganic-origins hypothesis is simpler. Occam might have seemed to smile on the life hypothesis instead.

In any event, ALH84001 left little doubt that Mars has had organic carbon, and that is a great find after the discouraging results from the Viking experiments of the 1970s, which ruled out life on the grounds that there seemed to be no organic carbon on the surface of Mars they examined.

There was a more telling criticism of the notion that those worm-like structures in ALH84001 were fossils, however: Many of the structures were much too small to be able to carry out many important organic functions that are typical of cells—some of them 50 or even 100 times smaller than the smaller bacteria known at the time.

The ensuing controversy spurred interest in the possibility that the Earth itself may contain bacteria that small. The interest increased when it was realized that the methods for looking for bacteria would not have detected such terrestrial "nano-bacteria" even if they existed. Lo and behold: biologists soon claimed to have found many such varieties of bacteria, even smaller than the presumed Martian bugs, right here on our own planet! Such discovery, however, seems to have been short lived. Later investigations revealed that some candidates to the title of nanobacteria are non-living mineral structures, e.g. calcium carbonate crystals, that do mimic bacteria in some respects and even reproduce (Martel et al., 2008). Although not as exciting perhaps, this finding is nonetheless an interesting discovery in its own right. Moreover, it has some practical medical importance, since those nanostructures are apparently involved in the formation of kidney stones.

The adventurous search for very small forms of terrestrial life continued, however, and culminated in 2015, when Dr. Jill Banfield and her team of scientists from the University of California at Berkeley (LBNL) announced in *Nature Communications* (Leuf et al., 2015) their discovery of ultra-small bacteria (250 nm), about the size of the larger Martian worm-like structures (see Figure 2 and Figure 3). They also *sequenced* the ultra-small bacteria genomes, which leaves no doubt about the bacterial nature of these structures. And we may hypothesize that primitive RNA bacteria without DNA could be even smaller: About 2 or 3 times smaller than ultra-small bacteria: about the size of many of the worm-like structures in ALH84001!

Scientific exploration challenges our ideas and frees the scientific imagination. The avenues of investigation that are so inspired can lead to important scientific discoveries, as we have seen in this example. Actual examples of alien life are thus likely to bring about a revolution in many areas of biology, leading to many discoveries that would in turn have great impact on medicine.

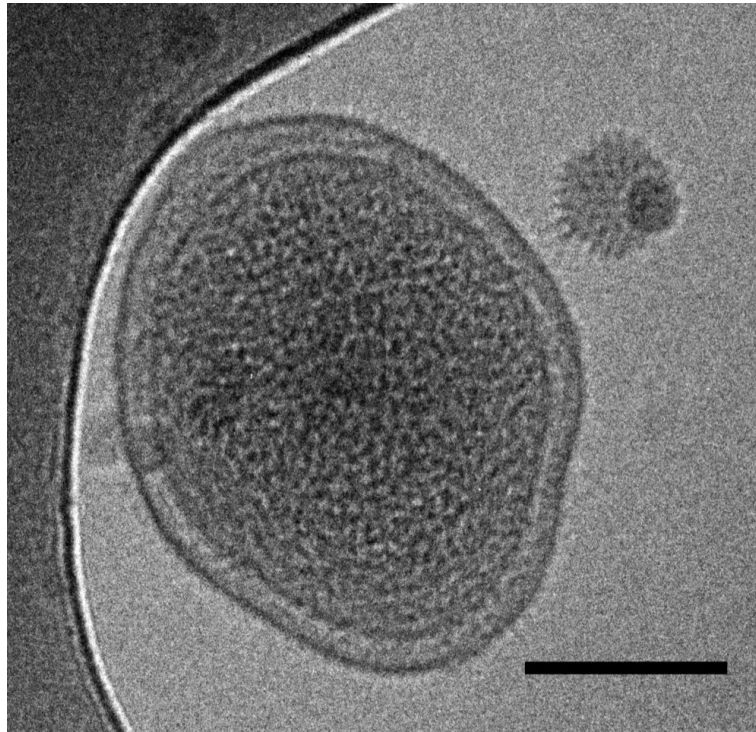


Figure 2. Ultra-small bacterium with dense interior and complex cell wall. Scale bar is 100 nanometers. Credit Drs. Birgit Luef and Jill Banfield. Courtesy of Dr. Jill Banfield, U.C. Berkeley.

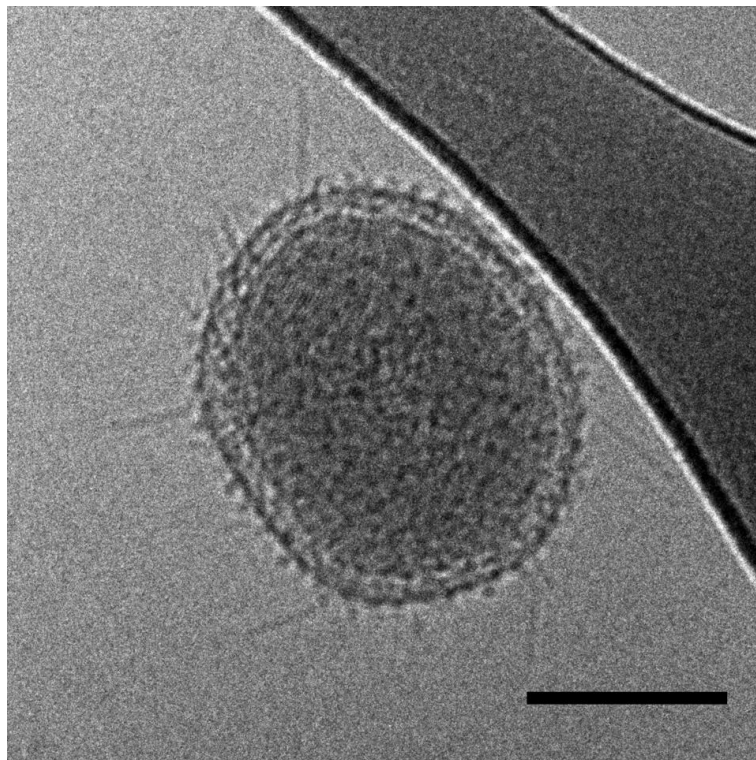


Figure 3. Hair-like appendages might be used by ultra-small bacterium to make contact with other microbes. Scale bar is 100 nanometers. Credit Drs. Birgit Luef and Jill Banfield. Courtesy of Dr. Jill Banfield, U.C. Berkeley.

Given such strong instrumental value, it is reasonable to conclude that our ethical obligation to preserve that alien life would be very high. It is an obligation to humanity, however, not to the alien life itself, at least not any more of an obligation that we have towards a group of terrestrial bacteria. Some may insist that the value of such life is intrinsic. It is worth pointing out, again, that the case made so far is purely instrumental. Moreover, the obligation to preserve that alien life would remain as long as it does not pose a threat to humanity. In that case, if we could not avoid it or contain it, we may have to destroy it. As Mark Twain put it, in *Letters from the Earth*, Noah could have rid the Earth of mosquitoes by keeping them off the Ark. In case of a deadly virus, for example, we would have to do far better than Noah.

Ethical Obligations to Intelligent Alien Life

It seems intuitive that in the case of intelligent alien life we are even more likely to have ethical obligations, well beyond the instrumental case made above. Obviously, the biological significance of highly complex beings will be greater still, although the key issue here is the fact that they are intelligent, presuming that we can make that determination. Still it seems, in any event, that biological considerations about the nature of intelligence and morality will prove of great importance. Charles Darwin explained how the foundation of morality “lies in the social instincts, including under this title the family ties” (2004). Developing this and other evolutionary insights, Patricia Churchland (2011, 2019), and several other authors have argued that the morality of species is indeed influenced by their biology. Such a point of view may perhaps present a difficulty for the intuition that intelligent life will demand a greater ethical obligation, for intelligent aliens would most likely be the result of a different basic biology: Do they have DNA, for example? And if they do and form cells, do they have the equivalent of prokaryotes and eukaryotes? And even if they did, it would be astonishing if their evolutionary history were anything like ours, for they are unlikely to have gone through the same sequence of environments that we have. Thus, what we might call their nervous systems would be extremely unlikely to resemble ours. As Michael Bradie points out (1994), then, we would not have a morality in common with them. Some may go further than Bradie and argue that, even if the intelligent aliens were moral agents in some way, we might not even be able to recognize them as such.

This is not the place to discuss whether the biological approach to morality is correct. The reader may consult my (1998) for arguments to that effect, which show, for example, that objections based on the “naturalistic fallacy” are actually instances of very poor reasoning (you may also consult my 2014).

Moving along a more optimistic avenue of thought, Peter Singer (1981) argues that social animals restrain their behavior to one another and do things for each other. Presuming that many of the intelligent aliens we might meet are social animals, this characteristic would give us something important in common. Nevertheless, even if we grant Singer’s point, we must realize that evolution produces very different ways of being social: take humans and bees as a clear example. Even closely related species, such as chimpanzees and bonobos, are social in different ways because of slight anatomical differences, as Dale Peterson’s examples (2011) make clear. Extraordinary biological differences could be expected to result in extraordinary differences in being social, and, presumably in being moral.

Julia Sandra Bernal (2012) explains how bipedalism, by freeing human hands, led to greater development of tools and access to many sorts of foods, while creating incentives for much higher cooperation and social expectations within human groups. As human intelligence increased, so did the size of the newborn heads, and thus the need for human babies to be born prematurely, compared to other species. This in turn led to many

social mechanisms to support the new mothers and their infant children, including, Bernal argues, a tendency towards (serial) monogamy and strong emotional ties on the part of the fathers. She then argues that these biological factors played a great part in the development of morality and law among hunter-gatherers and the much larger human societies that appeared later. The chances of an alien intelligent species to evolve in a similar way are simply extraordinarily small, and thus they would be unlikely to have a similar morality (or a similar range of moralities) to ours. This would be in addition to having different cognitive evolutions, which would probably make communication very difficult.

According to E. O. Wilson (1978), moral intuition seems to be the final moral arbiter. What exactly would prevent the intelligent aliens from having similar moral intuitions to ours? The answer is implied in the previous remarks: Moral intuitions are based on moral emotions that result from the operation of certain brain regions. That operation, however, is the result of a long evolution (as are those brain regions), and, therefore, *radically different intelligent species are likely to have very different moralities*. To see that such differences are not limited to mere rules of conduct but apply to ultimate moral principles, let us make use of John Rawls' Veil of Ignorance (as in Munevar, 1998).

Rational agents, Rawls tells us, choose consistently with their best interests. Looking through the Veil of Ignorance (unaware of his or her social position and personal characteristics), a rational agent would choose that the society should allow him or her maximum freedom consistent with equal freedom for others. Such rational agents, Rawls believes, would also reject the Principle of Utility, since this principle requires the sacrifice of individual happiness in order to achieve the greatest balance of happiness over unhappiness. If I, or anyone else, were to agree to the Utilitarian arrangement, I may be acting against my own interests (and thus being irrational) because the unfair sacrifice may fall upon my shoulders. As Rawls points out, this cuts too much against the grain of human nature.

If Rawls' famous account is correct, then radical differences in biology may alter the results of deliberations under the Veil of Ignorance. Imagine that rational ants exist in some faraway planet. Integral part of being ants is that they are dominated by a group mentality. An ant's equivalent of Rawls' *Theory of Justice* may find abhorrent Rawls' First Principle of Justice (of equal freedom), while looking favorably upon the Principle of Utility. And, of course, the biology of many intelligent aliens is likely to be even more radically different from ours than that of rational ants.

In a clear sense, however, the problem seems to be that the moral values of a species are relative to its biology. But this is a problem with a solution, according to Singer, as long as we treat the values of different intelligent species with impartiality. A utilitarian, for example, would calculate the balance of good vs. bad consequences of an action (its utility) with attention to the values of the individuals who would benefit from or suffer the consequences of the action in question. Neo-Kantian views respect impartiality as well. John Rawls' Veil of Ignorance makes us place ourselves in the shoes of all those who will be affected by a decision, and to avoid results that would be completely unacceptable to us, were we in the position of those most affected. This would make us rule out slavery, for example (Rawls, 1971).

Were we to encounter intelligent aliens, we would not wish to have them impose on us their notions of proper behavior regardless of our interests. This obvious realization should guide us in the approach we should take towards them. Where the only relevant difference between our wishes and theirs is that they are ours, we would generally not be in a position to give them reasons why they ought to behave as we want them to. Intelligent beings should presumably be able to come to the same realization. To insist on ignoring impartiality

would be done in the knowledge that they have no rational claim upon the behavior of other intelligent species with which they are interacting.

“Objective” values, then, need not be necessary for an ethics that expands to many societies, let alone to alien intelligent species. In the words of J. L. Mackie, “If there were objective values, then they would be entities of a very strange sort, utterly different from anything else in the universe. Correspondingly, if we were aware of them, it would have to be by some special faculty of moral perception or intuition, utterly different from our ordinary ways of knowing everything else” (quoted in Singer, 1981, p. 107). As Singer comments, if something in the universe were truly independent of us and our aims, desires, and interests, it could not provide us with reasons for behaving in certain ways. But values are supposed precisely to do that, for “To value something is to regard oneself as having a reason for promoting it” (p. 107).

We do have an element of universality in Singer’s account based on relative values, namely, once again, the realization that “...one’s own interests are one among many sets of interests, no more important than the similar interests of others” (1981, p. 106). Singer concludes that “Wherever there are rational, social beings, whether on earth or in some remote galaxy, we could expect their standards of conduct to tend toward impartiality, as ours have” (p. 106).

In addition to the instrumental case for ethical obligations to preserve alien life, if that life happens to be intelligent, we would have to consider what sort of behavior we should exhibit towards those aliens, just as we would need to worry about how they might treat us. It is extremely likely that finding ways of getting along will be crucial for all the species involved. Singer gives us the key to what we owe them: To treat them according to his principle of impartiality. This is what Reason would demand from us, as it would demand from them.

Apart from the likely difficulties in communication, lacking commonality of interests may obstruct attempts to behave ethically toward each other. Nevertheless, a reason for optimism is that in new circumstances complex intelligent beings are capable of developing new interests. Of course, we have no guarantee that Singer’s theory will be born out in every case: We may be unlucky enough to encounter the Nazi equivalent of a species. Still, Singer’s view on impartiality gives us some hope in facing a future that may await us in the stars.

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