



BIOLOGY

FOR FANTASY SETTINGS

By DEREK HOLLAND & THE SKIRMISHER GAME DEVELOPMENT GROUP

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When designing a fantasy setting, the biology of our home planet can provide a wonderfully rich resource for generating a new world and the creatures inhabiting it. But a world creator should not forget the fantasy aspect, or feel restricted to using Earth's biosphere as an unyielding template. Recently, I read several otherwise excellent articles that suffered from just this flaw: all described using real world ecology in fantasy settings, without providing any other options. Considering alternatives is what I would like to do here, to provide concepts for your use, not tell you what to do but in order to stimulate ideas and possibilities for your world. This article is not a complete survey of the subject — which would require a book — but, hopefully it will help you pick and choose from the amazing diversity of real life, as well as create new laws of biology to make your settings as useful and interesting as possible. The first two sections outline the basic biological needs of all creatures and gives some pointers on how habitats can be designed. These are followed by the meat of the article, which describes real world and fantastic biological concepts.

Biological Needs

First there are the basics. Every living thing needs food, water, and air, as well as shelter and a capacity to reproduce. Each of those can be easily altered for a fantasy setting. For example, a desert or wasteland ecosystem can support an amazing number of very large creatures if their food and water needs are reduced. If every creature on a particular fantasy world only needs 5% of the food and water that a similar Earthly creature needs, then there could be as much as 20 times the biomass.

Here are some more in-depth explanations and examples:

∞ Food energy can come from many different sources. Sunlight and magic are the two most obvious but souls, mental energy, lightning, planar gates, or microbes in the soil can all be sources of energy. Some animal life could use magic in a manner similar to deep sea tube worms. Instead of bacterial symbionts that consume superheated minerals, the gutless creatures would derive energy and mass from magic; if they do not have guts, then the creatures do not need mouths and can use the extra space for other organs that provide supernatural abilities. Plants convert energy from one form to another (radiation to chemical), so why not have creatures convert some types of magic into other types as long as it relates to their survival or they were created for that specific function? For example, a great lizard that turns fire magic into water could be the major source of water for desert oases; moths that turn lunar magic into necrotic energy could sustain a large population of undead that need to feed; and living stones might convert the magic within starlight into great heat to burn away the plants that attempt to grow over them.

∞ Water could be replaced with atmospheric moisture, thus removing the need to drink. Many desert species that live near oceans or seas do this by using



fog but that can be changed by a world designer who has decides there is enough humidity to keep creatures alive hundreds of miles from shore. Water can also be replaced by other fluids, such as alcohol, lava, mercury, or magical materials such as liquid diamond or copper. Changing the liquid needed for life will change the structure of the organisms that consume it, so those that need liquid diamond may have gemstone skeletons or eyes.

∞ Air is difficult to replace without having an extremely alien setting but its composition may make a difference. Take a world where mountains are extremely high. Instead of air becoming thinner as the altitude increases, the composition of the air changes and can support different kinds of life. The different compositions may be toxic or simply less effective in supporting the kinds of life adapted to other altitudes. Mountains, of course, are not required for the air to change, and certain magical locations may protect themselves or act as oases for specific life by altering air and even water. At the extreme, magic may allow life to exist without air at all. Flight could be jet-based or impossible and instead everything would walk, burrow, or swim.

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∞ Shelter can be very strange in a fantasy setting. Everything from a creature turning into an inedible rock to punching a hole into another plane of existence can give shelter from climate and predators. As long as a location provides protection of some sort, it is up for grabs by one species or another.

∞ And finally there is reproduction. This is one subject I have discussed in limited form in other articles and have barely scratched the surface. There is no reason that fantasy humans have to reproduce in the same manner as real humans. They could produce seeds or spores and grow children as a crop. Humans could drop a limb that turns into a baby (the limb may or may not grow back). A corpse may turn into several children if the person died of old age. Fantasy humans may even produce aquatic larvae and never see their children grow up, as only adults emerge from the waves. And of course these do not just apply to humans, of course, and anything might reproduce in just about any fashion.

All of these are significant possible changes to biology but never forget that fantasy allows for many different methods for meeting standard biological needs. Humans and their livestock on one island may be different in their food needs than those on a different island or the mainland. Creatures found all over the globe may change how they drink and reproduce depending on their location as they migrate. This means an adult wolf may drink water in the north and then turn to taking humidity

from the air in the southern deserts. Those sorts of changes may or may not require time, effort, or physical change (see phenotypic flexibility, below).

All in all, world designers should consider ecosystem and creature design from several angles before making a decision.

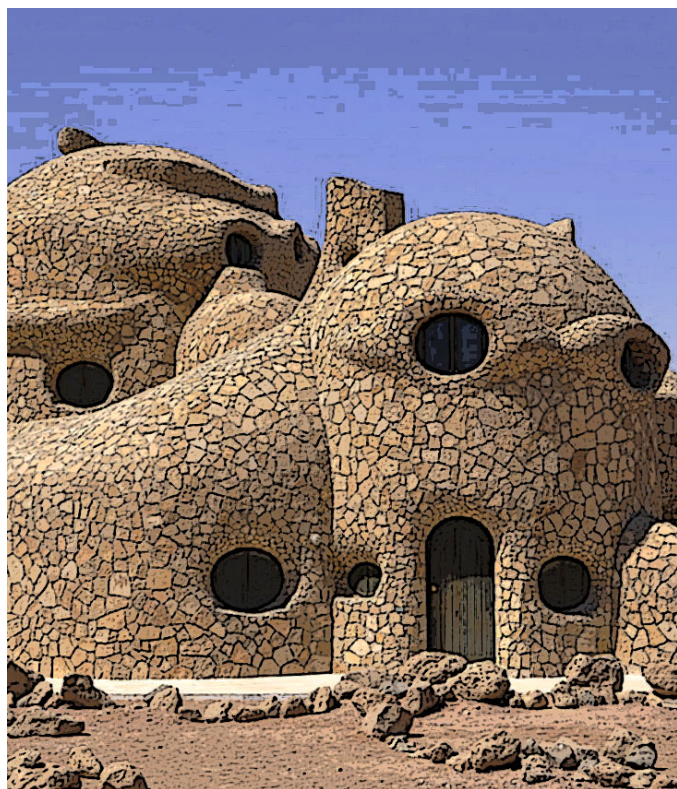
Habitats

Habitats are extremely varied in fantasy settings. One of the major habitats that has been used in fantasy settings is that of caverns and other underground structures. Some authors populate this underworld by having fungi as the base of the food chain. This works as long as the caves are very old, ancient enough to allow biomass to filter down from the surface and provide the fungi with the decomposing mass they feed on. There are also other possible sources, such as regenerating stone veins that are edible; magic radiation that acts as sunlight for slimes, alien plants; or tube-worm-like creatures; and the corpses of creatures that had migrate down to reproduce in huge numbers (sort of like salmon).

Habitats can also be related to a function of a creature's size. Some creatures, including people, may alter their size when moving from one location to another. Humans growing to giant size may be the only way they can protect their children in a world full of predators. Or there may be trillions of people who live separately from the original branch of their race by shrinking themselves down to the size of the head on a pin. This would help them survive in a world naturally bereft of insects and other small creatures that would prey on them (a rather unusual world indeed). In this example, the effects of climate would be more extreme and some creatures might evolve or learn to shrink themselves, so that the people are not perfectly safe. Some creatures find safety in the homes of others. Real-world ants and termites can host many other species of insects and other invertebrates in their colonies. Dragon lairs could have all kinds of pests and guests the reptile keeps around to keep out dragon slayers.

Some habitats may be useful in that they can support creatures in the same physical space at the same time. Creatures that can phase through each other because of the ambient magic may or may not detect each other. There is also the possibility of creatures that exist in more than one location at one time. Killing such creatures may be easy if all parts are vital, but collecting important bits or communicating with the beasts may be very difficult if the head is existing in a different plane or time stream.

Oases are places where life exists because of a resource, be it water, certain kinds of magic, air, or something else. Worlds that only exist as a series of oases would be mostly wasteland. Pockets of green



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would be filled to the brim with people or monsters, as living space is at a premium.

Some habitats are ephemeral and have a short life span and. They could be flooded basins like the Okavango Delta in Africa, a quickened version of succession (see below) where lakes fill and turn into forests, corpses of giants that feed many scavengers, lands scoured by the sun or a planar rift, or driven by divine action or order. Seasons could be considered a form of ephemeral habitats. There could be six seasons, each with its own dominant plant and animal life. Or different locations, like those underground or underwater, could have different kinds of seasons.

The edge effect can be important for creature design. This is where two different kinds of habitat, such as grassland and forest, meet. Along the edge, creatures from both places may be found. Ecotones are places where the habitats mix, extending the edge effect. They are important, as some creatures are only found there because they need something from both kinds of habitat.

Habitats can also be in microplanes, in the sky, within lakes of fire, and on giant creatures. It might be the case in a world that the closer one is to the sun, the warmer it is, meaning that jungles would be on mountain tops and arctic storms drop snow in deep valleys. Although oases of any form are helpful, there is no limit to where life can find an anchor, especially when magic is involved. See the ecosystem engineer below for creatures that manipulate or create their own habitats.

Biological Concepts

Next there are the real world and fantasy biological concepts that can be incorporated. Of the two I already described in previous issues of *d-Infinity*, spontaneous generation is the creation of life from non-living material and xenogenesis occurs where life spawns from other life but the two species are different. Some real concepts described below have technical names, something unavoidable as there is no common counterpart. I try to give at least one example per concept. Obviously, there are many that I did not list or even know about. The ones I selected are those I think, or hope, will be most useful to you.

∞ Alternation of generations is where a species has two or more adult forms that live in different habitats. This means the ripple effects of a species increasing or decreasing in population can be seen in different locations (similar to migration). Using alternation of generations allows the designer to link what may be very different species and allows survival of species that have one or more adult forms in very hostile conditions. If the size difference between the adults is great, it could also be seen as a form of metamorphosis (see below). Flowering plants might have an unusual life cycle that involves three different organisms; the body of the plant



is one, much of the flower is the second, and part of the seed — which feeds the embryo — is the third. Break these up into active creatures and plants can have many different forms that have to work together to survive.

∞ Aggregates — my term — are organisms that are fusing into one species. This has happened a few times in Earth's history, with cellular components like chloroplasts and mitochondria being the most famous. Aggregation does not have to be on the cellular level. Most of the times I have used it is when a parasite or mutualist, such as worms or fungi, have infested a host to the point where neither can survive without the other. Usually this is the result of environmental stress that would slay either or both species without the assistance of the other.

As an example, consider a fungal infection of the skin that provides the host protection from searing sunlight. The fungus would die without the skin and blood to feed on and the host would have to drink a lot more water or die of dehydration. In the early stages of fusion (in generations), some aggregates are actually weaker in some way than their original forms, as the two biologies compete. If this does not end relatively quickly, then the aggregate is doomed to extinction. Other methods of multiple creatures working together for survival are hiveborn or casted and multi-species herds (both listed below). Aggregates are different from chimeras in that they (the aggregates) are something that changes over generations.

∞ Allelopathy describes those plants that poison the soil around their roots to inhibit competition from other flora. This can be easily expanded to include animals that use poisons or strange magics to guard their homes and nests. See spellcasting below for the latter. If evolution exists in a world with allelopathy, then there may be creatures adapted to such poisons, thus allowing locations that have different complements of creatures than the surrounding landscape. In other words, the poisoned land (or water or air) may become a micro-habitat.

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∞ Animators are those creatures that cause objects to move. These could be predators that hunt with little danger to themselves because of the ability to cause stone masses to rise and slay prey, or herbivores that use animated plant life to defend themselves. In most cases, gaining the ability to animate objects results in smaller and weaker creatures, as they rely more on their objects than their other innate abilities. In worlds with evolution, this may even result in tiny creatures that ride their objects as vehicles.

∞ Atavism is important to those people who are partially unformed, such as wizard creations or divine castoffs. Atavism is the reduction of action to more primitive behavior, and is usually brought on by stress. Peoples with atavism may face prejudice and fear because of their lack of control.

∞ Casted, or hiveborn, creatures are like termites or bees, in which a single species has several different forms (e.g., queen, workers, soldiers, each geared toward a different aspect of survival. Hives can be found anywhere as they tend to greatly increase chances of survival.

∞ Chimeras are different from hybrids (below). Where a hybrid is the mixing of the genetics or essences of two creatures, chimeras are created when the bodies of creatures are fused together. In biology a chimera has the cells of two or more creatures. This allows the designer to take traits from multiple species. The negatives of biological chimeras is significant though. The less related the creatures are, the more problems with biochemistry arise. Wizards may only only be able

to create this kind of chimera while the other form (below) is relegated to the gods. Wizards are stuck with flawed creations because they simply do not have enough knowledge on how life works.

∞ In mythology, the chimera was a lion with a goat's head sticking out of its back and a snake for a tail. The idea is useful for monster designers and even the original chimera can be customized. Take any cat, medium-sized herbivore, and slender reptile and mash them together. But that is just the tip of the iceberg. Humans with animal traits are more likely hybrids but can be chimeras if the second creature is distinct (and it may or may not retain its head). As an example, a species of wise people could be humanoid with three heads — a human, a fox, and an owl. A sea monster chimera combining the shark and oyster can hide in plain sight before ambushing anyone foolish enough to swim near its shell.

∞ A complex — again, my term — is a collection of creatures based on one original species (the stock) that have identical traits and yet are different species. This usually happens when identical mutations occur to the same stock species but at different locations or times. One example is a complex of frogs that are the result of alchemical pollution. Even though all the tadpoles all turn into little, winged horrors that melt through human skin with their forefeet, each year's population is just different enough to be a different species. Species within a complex may or may not interbreed and form new species (see hybrids, below), but in all cases each member of the complex is different enough to be considered a separate species (otherwise it would not be a complex).

∞ Convergent species are different creatures that evolved similar traits. Some textbook examples are the wings of bats, birds, extinct reptiles, and insects, and the gills of fish and some insects. Using convergence allows a world designer to populate similar habitats with very different creatures that fulfill the same ecosystem function. This could be something like a giant bear that uses its tongue to break into buildings and extract humans in a manner similar to an anteater. Dragons could be similar to creatures from many different families — bear dragons, fish dragons, bird dragons, hornet dragons, and human dragons, to name a few.

∞ Death hibernation is when a creature dies and does not decay. When conditions for its survival improve, the creature returns to life. There are some very rare examples, usually microbes, of this happening in the real world. For fantasy, it allows creatures to exist in extremely harsh conditions and not go extinct. Something designers may wish to use are spores, seeds, and eggs that can survive indefinitely, or die and revive. People mining deep in the earth may find seeds of species that went extinct millions of years ago and now can be revived with sunlight and water.



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∞ Dispersal is how creatures, including plants, colonize new locations. Real-world plants use seeds that blow in the wind or are carried away, while animals use legs, wings, or fins (among other methods). In fantasy settings, the dispersal methods could be anything from teleporting to sliding within the cracks in the fabric of the universe. Such abilities can allow creatures entry into otherwise impenetrable locations. For example, in your world there may be a mountain valley that contain the seed stock of trees that use cannon-like organs to send seeds many hundreds of miles away. The trees that result are sterile as they can only reproduce in the valley and, because they are a source of medicine that retards aging, the location of the valley is desired by the powerful.

∞ Domestication (and see wizard creations, below) is a very important action by many kinds of people and a few non-sapient creatures. This provides food in the form of meat and fertilizer, as well as hides and muscle power. When deciding which species were domesticated in a fantasy setting, anything goes. People may use giant house flies as transportation, as they are very cheap to feed and reproduce in large numbers. Cats may be mounts instead of horses in mountainous terrain. One danger of domestication is feral livestock and crops. Some creatures regain their original, wild traits quickly or even have new traits that are dangerous unless kept in check by people. A crop may gain a deadly form if allowed to mature but is harvested many weeks before that. The reason this crop is used is that the plant grows well in current conditions and, if the farmers are slain, their crops may very well avenge them.

∞ Ecosystem engineers are those creatures that alter their surroundings. Beavers are one of the best-known examples: they build ponds for defense and transporting food. One fantastic example is a giant bee that uses magic garnered from wizard brains to form crystals for its hive. The crystals not only house the insects, they also encourage the growth of the massive flowers the bee relies on for food. Creatures that turn flesh to stone may use the resulting statues to form walls that deflect ley lines and form pools of magic the creatures “bathe” in and “drink” from.

∞ In the real world, fossilization takes a very long time. In fantasy settings, certain locations may cause flesh to turn to stone, or other material, within seconds. Fossilization could be a trait of a specific creature or family of creatures. Basilisks and gorgons are well known examples of creatures that fossilize others. An example of a creature that fossilizes itself is a giant bat that turns to obsidian upon death. The bat’s wings that are then used to make the sharpest blades known. Fossils could be valuable to wizards or engineers because of their composition or use as tools (such as the bat’s wings).



∞ Fusion swarms are creatures that normally are found in large numbers. When resting or facing a threat the smaller form cannot deal with, the creatures can fuse into a large form, be it simply a larger version of their small selves, a new form better suited to the threat, or an object. For example, some rats might take the form of pine trees so that their predators cannot find them. In some cases, chopping off parts of the larger form forces the smaller ones to revert and in other cases the part stays in the altered form and can be reattached.

∞ Hybrids result when two different species mate and produce offspring. The most popular roleplaying game had many different kinds of weird composite creatures in a recent edition but most of those were not true hybrids. Rather, they were halves added to wholes and one species therefore had its traits entirely expressed and the other had its traits weakened. A real hybrid can have traits from either parent and in some cases stronger abilities than the parents. One example of this are mice bred for color: some of those with dark fur end up with more black fur than the parent with that trait.

Reticulate evolution is where the hybridization of two related species form a new species. Some hybridization is natural and some is a result of domestication (I have seen that some strains of tomatoes are the offspring of more than a dozen wild species). The danger of using hybridization in many species is that the result is a genetic swamping of smaller gene pools. In other words, species with smaller populations will vanish, bred out of existence. On the other hand, hybrid vigor is a real-world concept in which the offspring are more fit — powerful in fantastic terms — than their parents. The problem with hybrid vigor is that it vanishes over time

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so that the hybrids, if they breed within their own population, will get weaker and eventually stabilize somewhat weaker than they were.

Reciprocal hybrids are those in which the sex of the parent matters for the traits of the offspring. Horses can interbreed with donkeys and when the father is a horse, the result is a hinny. If the father is a donkey, the hybrid will be a mule. A reciprocal hybrid of a male dragon and a female hydra might result in multi-headed dragons with the crest of the hydra. Female dragons and male hydras might produce dragons with single heads that can regrow them if decapitated. In most cases, both forms of offspring are sterile and it takes magic to allow them to reproduce.

∞ Hyperpredation is a nifty idea for fantasy yet has some unpleasant context in real world conservation. This happens when a predator that normally has a low population experiences an increase in numbers due to new prey. A real-world example is an island off of California where golden eagles are eating the endangered fox population out of existence because humans introduced pigs to the island. The eagles used to eat a few foxes but did not nest on the island because of the lack of food for chicks and competition from fish-eating bald eagles. After the pigs were introduced and the bald eagles killed off by pollution, the golden eagles started nesting on the island. The birds are quickly decimating the fox population because the foxes breed much slower

than the swine. A fantasy example could be lions that used shadows to hide within a forest. The local people there suffered some deaths but the cats were rare, at least until forest cattle were introduced as a new food source for the people. The cows and bulls consume vines and undergrowth and have been an important part of the forest people's survival. Unfortunately, survival is increasing for both species, as the lions' population has also been increasing. The cattle reproduce faster than the cats can eat them — a feature engineered into the cows is giving birth to six to 12 calves at a time — and this has caused the feline's population to explode. With so many more cats present, a much greater number than ever before have been wandering into villages and are quickly consuming the people, who simply produce too few children to replace their diminishing numbers.

∞ Inbreeding is where related creatures produce offspring. Outbreeding is the production of offspring between two individuals that are not closely related but are of the same species. Both can have depression, in which the offspring are less fit (i.e., weaker) and vigor, where the offspring are stronger, than their parents. Inbreeding also is a danger to species with many genetic defects, like humans, because the offspring tend to show more negative traits.

∞ Kinesis is behavior relating to a stimulus. In plants this is called tropism and is mostly related to light (causing them to turn toward the sun) and gravity



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(roots go toward gravity and the rest of the plant away) but this has much more potential in fantasy settings. Creatures could be drawn to the unique energy humans emit or be driven off by dark magics. One of the legends of a milieu might involve a lion bred to sense and kill necromancers. The lion(s) and its creator are the saviors of a small nation that would otherwise be overrun by undead monsters.

∞ Mesopredator release occurs when smaller predators' populations increase because the top-level predators are eliminated. As many characters are monster killers, this concept has more impact than most in this article. Killing off a dragon may seem like a good idea, but be ready for the Orc hordes or swarms of mountain wolves that result.

∞ Those species that go through metamorphosis might have an immature form that is slightly to significantly different than the adult form. The immature form goes through one or more stages. In insects these are called instars and I use that term for all fantasy creatures as well. This change in form allows a species to survive with more than one habitat, diet, and method(s) of defense against predators. Massive bison-like creatures could give birth in water, producing mammalian tadpoles that eat plants and fish. Fish eggs may hatch into fly-like creatures that consume carcasses that wash up on shore. The real power of metamorphosis in fantasy settings is instars that are very different from each other. A plant might have, for example, a worm-like larva with four instars, one adapted to each of the elements. The worm-like seedling must consume a specific amount of each element before being able to transform into a plant with powerful magic that allows it to survive almost anywhere. There might be a species of starfish that has a larva that produces a miniature adult and then survives for months after releasing it, or a caterpillar that produces a butterfly from only from part of its body and has inspired some wizards to attempt splitting their living creations to save on time and money.

Size does not have to make sense. A massive snail could be the larval form of a normal-sized rat and the transformation turns the snail into hundreds of thousands of rats. A sea snake could be the larval form of a flying squid. Take any two creatures from your setting and see how they might fit as larval forms of the other to provide yet more ideas for creature design.

∞ Multi-species herds and hunting alliances are simply creatures that are always or almost always found together. This concept is more significant, and has greater impact, than the different animals coming to a watering hole and watching out for each other or ground animals listening to bird calls. As time passes, if the world is subject to evolution the different species will become more and more specialized, although most will



still be easy to discern as different kinds of creatures. One example of a hunting alliance is the combination of hawks and wolves. The hawks go after smaller prey and use their eyes to detect danger, while wolves take larger prey and use their sense of smell. Both share their food with the other. The only time they are apart is when the wolves have to find food far from the hawks' nests. Another example would be sheepdogs and their flocks. This is an artificial multi-species herd but it works just as well. If they go feral, the dogs will continue to protect their sheep and there may even be evolution where the sheep improve their abilities to survive and the dogs may use the sheep as bait to draw tasty predators. For a purely fantastic example, crystal monkeys might live with fire rhinos — named for the burning poison in their horns — in a tropical rain forest. The rhinos knock down trees that protect their fruit with great spines, which monkeys cannot pass, and the monkeys keep an eye out for the great serpents that feed on the rhinos.

∞ Non-standard biology is life not as we know it. Some of it is based on the tinkering of wizards (see below) while the rest result from strange evolution or divine creation. Elementals fit here and they could make up a significant portion of a world's population. Life could be based on glass with mercury as "blood" or made of iron that feeds on heat to keep it flexible. In fantasy settings, genes and genetics may be replaced with patterns of tiny gems from which flesh grows, or runes of energy. In any case, this has no effect on mutation, evolution, or hybridization unless the game or setting designer states this is so.

∞ Parthenogenesis describes a species that does not have any male members. Some mate with males of other species and take some of their fathers' traits for a single generation (these are called hemiclones), but most are simply clones of their mothers. The danger in real-world environments are disease, which can kill large numbers of clones easily, and habitat change, which can wipe out a species well-adapted to the previous

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environment. Fortunately for fantasy settings, these can be easily ignored or used as adventure hooks. People who are parthenogenic may treat males with fear or as curiosities. Creatures that are parthenogenic may be able to outbreed sexual creatures, as there are no males to compete for resources. Of course this can also lead to the starvation or infighting that accompanies overpopulation.

∞ Phenotypic plasticity is the effect the environment has on developing life (i.e., creatures still in the egg or womb). Phenotypic flexibility is the same but applies to adults. A species of wolf that must drink in the north and can use humidity in the south is a form of flexibility. Most, but not all, of these alterations are useful for survival. Some changes are simple like colors or minor behavioral alterations. Others are significant, like snakes that rebuild most of their heart and guts after eating. Dragons may have different forms of breath weapon depending on their diet as hatchlings or they may be able to change it willingly by flying or swimming somewhere else.

∞ Philopatry is the desire to return to one's birthplace to give birth or lay eggs. Salmon and sea turtles are the best-known examples in the real world. Fortunately for them and some fantastic creatures, this can be altered. A female may be driven by instinct to have her children in one location but can be moved to another by will or force as to start a population

elsewhere. If creatures can not alter the place of their birth, this provides a significant danger to the whole species, because if the location is destroyed the species will go extinct. Intelligent creatures will either hide their birthplace or protect it with great force. The dragon-birthing mountains are lethal to anything over a pound for the spring and summer months, and dragon slayers who survive for any length of time know better than to attack there during the breeding season.

∞ Preadapted traits are those abilities that work as well or better in another location or habitat. A desert-dwelling humanoid could find its thin skin, used to dump heat, makes excellent gills (if poor armor). When designing creatures, look at all of their traits, even those that appear very commonplace, and see if they can be used in different ways.

∞ Sexual dimorphism is where the sexes of a species look and potentially act differently. In the real world, birds are well known for males having bright colors and females being drab (as well as slightly larger). In spiders, females can be much larger than males and much more aggressive predators. In fantasy settings, males and females may not look anything alike. A male could be a mite-like creature or a whale whereas the female could be an octopus or seal. This could mean hunting one creature out of existence may very well cause another to vanish as well. It also means a mother may not look like her offspring and someone hunting or collecting small, innocuous male creatures may have to deal with an angry giant female looking for her mate.

∞ Shapeshifting is different from metamorphosis. Where the latter takes hours to centuries, shapeshifting generally takes seconds to minutes. Both adults and immature creatures may be shapeshifters, or it may be a trait that only exists in one or the other. Like metamorphosis, shapeshifting allows a creature to use two or more habitats, food sources, and methods of escaping predators. One significant difference is that some shapeshifters can imitate specific individuals. A creature that hunts humans by eating them and taking their form is very common in fantasy literature. But that is just the tip of the iceberg. Shapeshifters may use their ability to hide during the night or day, to migrate from feeding areas to breeding grounds, or to surprise predators of their allies and slay them. One type of shapeshifter warps the creatures and/or objects around them when they change. This could be from a divine curse — or blessing! — or simply a bleeding of the magic that allows the creature to change.

∞ If spellcasting or other magic can be performed by non-sapient species, then it would provide a powerful advantage, especially in worlds with evolution. If ants can create glyphs in walls of their nest, apes perform the most crude, but effective, alchemy or spellcasting or plants form runes on their leaves, then all may have



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the capacity to refine those abilities. One subset of spellcasting is those who use curses to defend their nests, young, or treasure. Dragons are not the only hoard-building monsters in fiction and there is no reason that other creatures might not hex those who steal from them.

Another subset is those who use magic to expand their territory by both climate change — or whatever the creature needs to survive — and translocation (i.e., getting the creatures to the new habitat). Remember, evolution is without forethought, so this is just adding magic to the natural traits of creatures that change through time. To read more examples, see the article “A Rainbow of Slimes” in this volume of *d-Infinity*.

A different subset of spellcasting are those creatures that alter magic for defense or diet. A species of cow that turns the fire magics of its food into teleportation effects for defense is protected from most predators. Plants that are near evil magic turn it into light, silver threads, and iron spikes — defenses against various dark beings. Trees that consume light and form perfect darkness under their branches will soon drown, as they are colonized by land crabs that eat such darkness and produce water as a waste product. A spider that creates its web several miles in the air may convert teleportation spells into containment magic and then talk its visitors to death. A giant eye that consumes divination magic also affects magical disasters, muting them before being forced to teleport elsewhere. A dog might turn healing magics used near it into kittens (its favorite food).

∞ Succession is where a location changes over time. The textbook example is the pond. It is formed when something, usually glaciers or bulldozers, form a depression in the soil that fills with water from a local stream or water table. Over time, the fills and the complement of organisms within it changes because of the differences in the amount of light and oxygen that result from the change in water depth. Eventually, the pond turns into a wet patch of soil, possibly a bog or a

marsh. After that, it becomes grassland or forest. Forests are the other example of succession, as they start off as meadows or plains and different complements of plant and animal species colonize. They progress from grass and forbs to shrubs to trees, eventually resulting in an old hardwood forest (or conifers if far north). For fantasy settings, this is most important to nature priests. They can set up a location that will turn into what they desire, even if it takes decades or centuries.

∞ Useful genetic defects are those that provide protection from one source of harm while inflicting it in another form. The best known example is sickle cell anemia, a genetic flaw that allows people to resist malaria and yet causes red blood cells form improperly, weakening or killing them. In attempts to help people with such a disease (the sickle cell in this case), spellcasters may cause the extinction of those creatures that use this form of protection (as malaria will wipe them out).

∞ In one of the sources I mentioned in the introduction, wizard creations were mentioned as something that should be rare and usually sterile. I think that is, suffice it say, too restrictive. Wizard creations could quite easily replace natural species as nature (little n) does not have any sense of morals (unlike Nature, the god that some druids follow). If a magical predator is better than a mundane predator that eats the same prey, the mundane is doomed to extinction or, at best, life in a zoo. The problem with magically-engineered creatures is a poor sense of understanding by the wizards who performed the spells. Unless the life is extremely simple or alien — or there is no evolution in the setting — life will mutate naturally and spread beyond its intended function unless watched and guarded very closely.

That being said, wizards could make their respective worlds much better places by improving versions of many domesticated species, as well as bringing more

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species into the fold of livestock and crops. Humans could populate and alter deserts in large numbers if cacti were changed to make water out of soil and sand. People could colonize dead worlds with the help of plants and animals adapted to a lack of air. Pest species that were created by gods of disease could be wiped out of existence with predators created specifically to eat them. Trees with deep roots could make leaves and fruit of iron or other metals. Vines could produce melons filled with potions.

Wizard creations can provide a designer a lot of fun, as they allow for extremely weird creatures. In some worlds the biology of the creations are different from the physiology of natural species. To make his creations sterile and non-invasive, a wizard could make life out of glass, iron, or even a plant that collects and refines sunlight to power flying ships or alchemical processes. A wizard can also make creations that produce yet other creatures. An egg that hatches into six species could be highly useful to a beast master or rancher.

Final Words

I am guessing that you are wondering how the heck a world can survive with anything resembling a normal biosphere after reading all this! The only reasonable

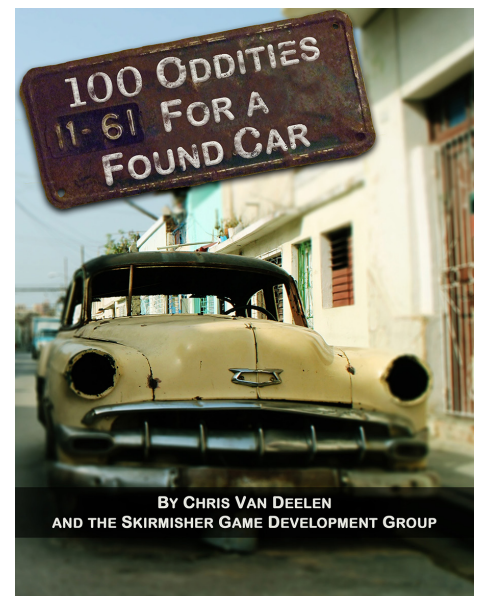
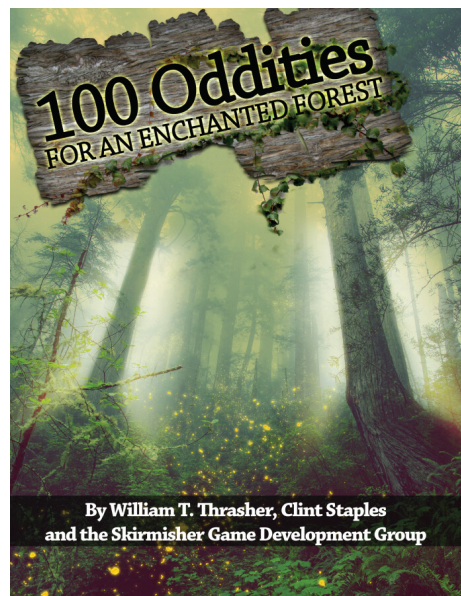
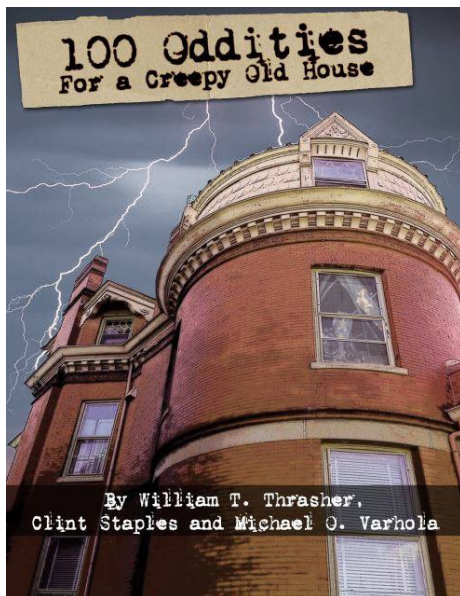
solution that I have come up with is divine intervention. The gods constantly revise the world to keep it in some semblance of balance and keep their worshippers relatively safe.

Now how to use all of this. Setting designers have a lot to pick and choose from in all aspects of the world. For biology this is just as broad as most other subjects. When creating a creature, habitat or population for an area, the designer should look at it from the standpoint of the characters.

For example, when I used a humanoid predator in a desert setting, I gave it phenotypic flexibility. When most of its diet was large surface-dwelling lizards, its fingers would be short and strong. But when it fed on rodents that burrowed in the soil, then its fingers would lengthen and grow sharp claws. As long as the predator did not find the rodents, it would continue to feed on the lizards. This knowledge allowed the characters to know if there was something worth hunting in the area: both the predator and lizards had toxic flesh, but the rodents were the main source of food for humans who lived in the deep desert.

Terms do not matter, but the results of the biology on the setting and how the characters interact with and understand their surroundings do very much matter.





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