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Devitt's 'Intrinsic Biological Essentialism'

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This article is about the problem of essentialism of natural and biological kinds, especially species. We will primarily focus on Michael Devitt's work "Resurrecting Biological Essentialism" (2008). We will try to prove what a good candidate for the essence of the species could be. This article puts the problem of essentialism into the context of biology and, through the usage of examples, attempts to answer that problem. We are going to try to define essentialism and determine what meaning essentialism holds in biology. We will cross-check the definitions of essentialism and compare the essence of various sciences with the suggestions of essences of species. We are going to analyse what Hilary Putnam states about natural kinds, about the so-called 'hidden structures', and what the essence of species could be. Using examples from biology, we are going to create a difference between 'underlying' and 'exterior' characteristics of organisms. We are going to analyse Devitt's 'Intrinsic Biological Essentialism' (2008) and check its advantages and disadvantages. Using examples from biology and using the analogy of examples from chemistry and biology, we will show whether Devitt's 'intrinsic biological essentialism' is valid or not.

Keywords: Michael Devitt, essentialism, natural kinds, species.

1. *Introduction*

One of the more important discussions among biologists and philosophers of biology is about the nature of species. Okasha says that the debate about the nature of species is still discussed and there is no agreement about this issue (Okasha 2002: 191).
Bird and Tobin state about essentialism:

> Kripke (1971, 1972) and Putnam (1975a) use animal kinds as examples of natural kinds for which a posteriori essences can be found. There is some implication that these essences are microstructural, intrinsic properties,

> which will be, of necessity, individually necessary and jointly sufficient for an entity to be a member of a kind. However, if species are individuals, then it is not true that species may be individuated on the basis of the intrinsic properties of their members. /…/ According to the BSC, for example, membership of a species depends on relational properties, such as membership of a certain population and interbreeding. Alternatively, the PSC refers to shared descent (Bird and Tobin 2017).

What makes this specific kind unique and not any other is the main question. Putnam says that the essence of lemon lies in its 'genetic code', and this is what makes this lemon—the individual specimen of lemon, a member of a species—lemon (Putnam 1975: 239–240).

When it comes to the 'genetic code', Putnam states that:

> At the same time the sense in which to be a lemon something has to have the genetic code of a lemon is not the same as the technical sense (if there is one, which I doubt). The technical sense, I take it, would be one in which 'lemon' was synonymous with a description which specified the genetic code. But when we said (to change the example) that to be water something has to be H_2O we did not mean, as we made clear, that the speaker has to know this. It is only by confusing metaphysical necessity with epistemological necessity that one can conclude that, if the (metaphysically necessary) truth-condition for being water is being H_2O, then 'water' must be synonymous with H_2O—in which case it is certainly a term of science. And similarly, even though the predominant sense of 'lemon' is one in which to be a lemon something has to have the genetic code of a lemon (I believe), it does not follow that 'lemon' is synonymous with a description which specifies the genetic code explicitly or otherwise (Putnam 1975: 240).

One of the problems "is that a natural kind may have abnormal members" (Putnam 1975: 140). As an example, Putnam gives the green lemon, which is still a member of the kind lemon

He writes:

> The supposed 'defining characteristics' of lemons are: yellow colour, tart taste, a certain kind of peel, etc. Why is the term 'lemon' not definable by simply conjoining these 'defining characteristics'? The most obvious difficulty is that a natural kind may have abnormal members. A green lemon is still a lemon—even if, owing to some abnormality, it never turns yellow. A three-legged tiger is still a tiger. Gold in the gaseous state is still gold. It is only normal lemons that are yellow, tart, etc.; only normal tigers that are four-legged; only gold under normal conditions that is hard, white or yellow, etc. (Putnam 1975: 140).

Putnam says that the existence of certain characteristics represents the main essential element that is common to other members of a particular natural kind (Putnam 1975: 140–141). He states:

> If I describe something as a lemon, or as an acid, I indicate that it is likely to have certain characteristics (yellow peel, or sour taste in dilute water solution, as the case may be); but I also indicate that the presence of those characteristics, if they are present, is likely to be accounted for by some 'essential nature' which the thing shares with other members of the natural kind. What the essential nature is is not a matter of language analysis but of scientific theory construction; today we would say it was chromosome

> structure, in the case of lemons, and being a proton-donor, in the case of acids (Putnam 1975: 140–141).

Can we, therefore, conclude that intrinsic characteristics are the main essential elements of a natural kind? As Putnam claims, in some cases that is true. Can the same be claimed for the species, for those organisms which are known for always evolving? We are going to try to analyse this viewpoint.

We will help ourselves with Putnam's example of the atomic number of gold (Putnam 1975).

However, let us first look at what Okasha writes: "Thus science has taught us that the real essence of gold is 'having atomic number 79', according to Kripke and Putnam—this is the underlying microstructural property which explains why all samples of gold are shiny, yellow and malleable" (Okasha 2002: 194–195).

As Putnam conclude: "To sum up: if there is a hidden structure, then generally it determines what it is to be a member of the natural kind, not only in the actual world, but in all possible worlds" (Putnam 1975: 241–242).

There is also a problem about how we classify objects. As Okasha states:

> One possible source of philosophical opposition to a relational taxonomy stems from a general view about the purpose of classifying in science. /…/. That is a philosophical commonplace. /…/ According to a widely held view, what makes one classificatory scheme more fundamental than another is that it permits more predictively useful generalisations to be formulated (Okasha 2002: 207).

Okasha states that Kripke and Putnam were not incorrect when saying that morphological characteristics are important when defining species and these criteria are "indicative of something deeper" (Okasha 2002: 203). Furthermore, Okasha says that: "… their error lies only in a mistaken view of what that 'something deeper' is" (Okasha 2002: 203).

We are going to provide an answer regarding essentialism when considering species; that is why we will start with an analysis of this problem, and then immerse ourselves into Devitt's 'intrinsic biological essentialism'.

2. *Essentialism*

> "Essentialism about species is today a dead issue"
> (Sober 1994: 163).

One of the problems of philosophy of biology is the problem of essentialism. Michael Devitt begins his own article with the same quotation from Sober. However, is this point of view valid?

Devitt explains that the term 'essentialism' is unsuitable for biologists because of its connection with "Aristotelian metaphysics" (Devitt 2008: 347).

Devitt in his work says:

> But the essentialism I have defined need not come with those Aristotelian trappings. Many philosophers would be similarly reluctant because the term 'essentialism' strikes them as quaintly old-fashioned, scholastic, even unscientific. But such reluctance would be a merely verbal matter (Devitt 2008: 347).

When we talk about 'essentialism' it is important to know that the problem of 'essentialism' will remain independent of the term.

Devitt states:

> It is the issue of in virtue of what an organism is a member of a certain Linnaean taxon; the issue of what makes an organism a member of that taxon; the issue of the very nature of the taxon. I stick with 'essentialism' because it is the term that philosophers of biology use for the doctrine that they want to reject and I want to promote. Those who are offended by the term, should replace it with one of the other ways of characterizing the issue (Devitt 2008: 347–348).

Nevertheless, we have still not defined what essentialism is.

Let's look what Robertson and Atkins says:

> Essentialism in general may be characterized as the doctrine that (at least some) objects have (at least some) essential properties. This characterization is not universally accepted, but no characterization is; and at least this one has the virtue of being simple and straightforward. (Robertson and Atkins 2018)

Furthermore, Sober claims that essentialism: "… is a standard philosophical view about natural kinds. It holds that each natural kind can be defined in terms of properties that are possessed by all and only the members of that kind" (Sober 2000: 148).

As already mentioned, one of the examples stemming from biology is the case of lemon, which was provided by Putnam. Here we can observe that he is suggesting that the essence of a species, in his case lemons, is some inner structure of an organism (Putnam 1975: 140–141).

We find it interesting what Ney says about essences:

> A historically interesting position in metaphysics is that objects have certain properties that hold of them necessarily, so-called essential properties or essences. /…/ [However,] more controversial is the issue of whether material objects like tables, chairs, or organisms have essential features (Ney 2014: 193).

Turning back to Putnam, he argues that gold is of great significance for us and we can use gold in different ways and for different purposes (Putnam 1979: 227). For example, my earrings are made of gold, the Golden Buddha statue is made of gold and there is also a champagne with flakes of gold floating in it.

Sober says that the members of the same kind have to share common properties that are characteristic of that kind, and thus what is important is not the common history of individuals but their similarity (Sober 2000: 148).

Putnam and Sober, show in their examples that the essence of gold is its atomic number. The important question for us is, therefore: What are the essential properties of species?

We could start with the example put forward by Sober. "We now can examine the idea that evolutionary theory refutes essentialism as a view about species" and that:

> One argument goes like this:
> Natural kinds are immutable.
> Species evolve.
> Hence, species are not natural kinds. (Sober 2000: 149).

The objects made of gold, for example, gold earrings, can change while "the nature of gold" remains the same way, this holds, *mutatis mutandis*, for species (Sober 2000: 149). But as Sober further states:

> Once the first premise is clarified in this way, we can see that the argument is flawed. Transmutation of the elements is possible… However, this does not undermine the idea that the chemical elements have immutable essences. Likewise, the fact that a population belonging to one species can give rise to a population belonging to another does not refute essentialism about species (Sober 2000: 149–150).

We can illustrate this using speciation. Let's look what Mayr says about speciation in his work *Systematics and the origin of species, from the viewpoint of a zoologist* (1942):

> One part of the process of speciation is the establishment of discontinuities, that is, the establishment of isolating mechanisms and their perfection to the point where reproductive isolation is accomplished and the "parent species" breaks up into two or more daughter species. (Mayr 1942: 23)

Furthermore, Ereshefsky says that: "In all but a few cases, speciation is a long and gradual process such that there is no principled way to draw a precise boundary between one species and the next" (Ereshefsky 2017).

Sober explains why essentialism is the "wrong approach regarding species" (Sober 2000: 151). While phenetics believe that species are characterize by "phenotypic or genetic similarities", biologists who are in favour of different concepts, for example, Mayr's biological concept or ecological-niche concept, don't think so (Sober 2000: 151).

One of the problems is that organisms of the same species could live in various habitats. As Sober argues, this means that they have to adjust to different environmental conditions. There are some dissimilarities between taxonomic ranks (species, genus, family, order) and this need further explanations (Sober 2000: 160).

Okasha agrees, saying that philosophers of biology acknowledge that "species are not individuated by essential characters" (Okasha 2002: 196).

Moving on, we are going to endeavour to prove whether a certain genetic characteristic is a candidate for the essence of a species. The question here is also whether DNA can be the essence of a species.

The member of the same species, for example, the members of species mute swan (*Cygnus olor*) have some "genetic similarities" among themselves (Okasha 2002: 197).

However, if we look at human beings:

> The vast majority of humans have 23 chromosome pairs, for example, while the primates most closely related to us normally have 24. But not all humans have 23 chromosome pairs—sufferers from Down's syndrome and other genetic diseases have additional chromosomes, but are still clearly human. As it is at the level of morphology, so it is at the chromosomal and genetic levels—species taxa are distinguished by clusters of covarying traits, not by shared essences. The idea that species can somehow be "defined in terms of their DNA" has no basis in biological fact, despite what many non-biologists appear to think (Okasha 2002: 197).

There are examples of organisms that have the same number of chromosomes and are of the same species, for instance, broccoli and cabbage. However, there are some examples where members of the same species have different numbers of chromosomes. Jack jumper ant *(Myrmecia pilosula)* have 1 or 2 chromosomes, female have 2 and males have 1, but they still belong to the same species, *Myrmecia pilosula*.

Furthermore, an example from botany shows that different species can have the same number of chromosomes. Barley (*Hordeum vulgare*) and Garden Pea (*Pisum sativum*) are two different species and they also differ in genus, but they have the same number of chromosomes.

One of the conclusions that Okasha built from his article, with which we do not agree, is that: "The anti-essentialist arguments of philosophers of biology show only that species cannot be defined by essential intrinsic properties" (Okasha 2002: 210).

We will, following Devitt, hope to show that this is not the fact. This will be done by analysing Devitt's thesis about intrinsic property, his 'intrinsic biological essentialism', and comparing it with arguments from Okasha and Sober.

3. *Devitt's 'intrinsic biological essentialism'*

> Essentialism is a thesis about what it is for an organism to be, say, a dog not a cat, not about what it is for, say, dogs to be a species not a genus.
>
> (Devitt 2008: 346)

Michael Devitt, in his article "Resurrecting Biological Essentialism" (2008), defends the claim that species and other taxa (genus, class, phylum, and so forth) "have essences that are, at least partly, underlying intrinsic, mostly genetic, properties" (Devitt 2008: 344).

We will try to analyse Devitt's view on essentialism in biology: A property P is an essential property of being an F iff anything is an F partly in virtue of having P. A property P is the essence of being an F iff anything is an F in virtue of having P. The essence of being F is the sum of its essential properties (Devitt 2008: 345).

Devitt argues that essence can have some variations. He says that:

> Essences can be fully intrinsic; for example, the essence of being gold is having atomic number 79. Essences can be partly intrinsic and partly extrinsic and relational; for example, the essence of being a pencil is partly being an instrument for writing, which an object has in virtue of its relation to human intentions, and partly having the sort of physical constitution that distinguishes it from a pen, which an object has intrinsically. Finally, essences can be fully relational and extrinsic; being Australian is probably an example because it seems that anything—Rupert Murdock, Phar Lap (a horse), the Sydney Opera House, a bottle of Penfolds' Grange, the expression "no worries mate," and so on—can have the property provided it stands in the right relation to Australia. (Devitt 2008: 345–346)

This classification, especially the 'fully intrinsic essence', can be used in biology. With Linnaean taxa, Devitt points to kinds which belong to Linnaean hierarchy. Those are kingdom, phylum, class, order, family, species, subspecies, etc. He focuses on species, but claims that essentialism concerns all taxa (Devitt 2008: 346).

For our discussion, it is important to know which definition of species is the best so far, so that we can see what characteristics are important when defining species. Mayr's definition (biological species concept) is the most widely accepted definition of species. It claims that: "Species are groups of actually or potentially interbreeding natural populations, which are reproductively isolated from other such groups" (Mayr 1942: 120).

On the other hand, Devitt presents two arguments supporting 'intrinsic biological essentialism'. One is that: "Such essential properties seem to be part of what 'genome projects' are discovering" (Devitt 2008: 351) and the second is about generalizations (Devitt 2008: 351).

Concerning generalizations, he writes:

> We group organisms together under what seem, at least, to be the names of species or other taxa and make generalizations about the morphology, physiology, and behaviour of the members of these groups: about what they look like, about what they eat, about where they live, about what they prey on and are prey to, about their signals, about their mating habits, and so on (Devitt 2008: 351).

Devitt agrees with Sober when he says that the "essence of species" should tell us the basic characteristics of its members (Devitt 2008: 353). For example, the essence of proteus (*Proteus anguinus*) should tell us the common characteristics for all its members and explain us why proteus is the way it is. *Proteus anguinus* have certain characteristics that are typical for all its members.

Let's look at what he says: The intrinsic difference explains the physiological difference. If we put together each intrinsic underlying property that similarly explains a similar generalization about a species, then we have the intrinsic part of its essence (Devitt 2008: 352).

We know that biologist classify most organisms according to their similarities. Devitt argues that "they do so partly on the assumption that those similarities are to be explained by some intrinsic underlying nature of the group" (Devitt 2008: 352–353).

Devitt gives us another example, the example of the tiger. So the apparently superficial explanation points to the deep fact that there is something intrinsic, probably unknown, partly in virtue of which the animal is a tiger and which causes it to be striped. That something is an essential intrinsic property (Devitt 2008: 353).

In what follows, we will analyse whether some "underlying intrinsic, mostly genetic, properties" (Devitt 2008: 352) could be the essence of a species.

4. *A candidate for the essence of species*

> This was not any old molecule: DNA, as Crick and I appreciated, holds the very key to the nature of living things. It stores the hereditary information that is passed on from one generation to the next, and it orchestrates the incredibly complex world of the cell.
>
> (Watson, Berry, and Davies 2017: xi)

If DNA "holds the very key to the nature of living things" (Watson, Berry, and Davies 2017: xi) then it must show us some important information about organisms and what makes an organism belong to a particular species. This goes together with Devitt's idea of 'intrinsic biological essentialism'.

The thesis of this article regarding the essentialism of species is the following: we agree that one of the essential properties regarding species could be Devitt's "at least partly, underlying intrinsic, mostly genetic, properties" (Devitt 2008: 344).

The ideas supporting this thesis are as follows. 1. The first idea is connected to Devitt's argument about "genome project", which is still in progress (Devitt 2008: 351). We will be using some selected authors from biology to make our case.

Hebert et al. write:

> Genomic approaches to taxon diagnosis exploit diversity among DNA sequences to identify organisms (Kurtzman 1994; Wilson 1995). In a very real sense, these sequences can be viewed as genetic 'barcodes' that are embedded in every cell" (Hebert, Cywinska, Ball, and deWaard 2003: 313).

This procedure of recognizing species has some restriction:

> First, both phenotypic plasticity and genetic variability in the characters employed for species recognition can lead to incorrect identifications. Second, this approach overlooks morphologically cryptic taxa … Third, since morphological keys are often effective only for a particular life stage or gender, many individuals cannot be identified. Finally, although modern interactive versions represent a major advance, the use of keys often demands such a high level of expertise that misdiagnoses are common (Hebert, Cywinska, Ball, and deWaard 2003: 313).

Let us examine the following idea. 2. We want to show that the exterior characteristics of an organism, the so-called morphological marks, are not always reliable when identifying organisms.

Some unrelated organisms could be quite similar. For instance, the snake—the aesculapian snake and a lizard—the slow worm. To this very day, we still come across misconceptions that the slow worm is a snake because of the similar characteristics that these two organisms share. Most lizards have legs, whereas slow worms do not have them, thus slow worms look like snakes to laymen.

The slow worm (*Anguis fragilis*) is a legless lizard. "There are two properties by which we can distinguish the slow worm from a snake: the slow worm is able to blink and shed its tail." (*Plazilci Slovenije-jih poznamo* 2018).

With this example, we are trying to show that the exterior characteristics of organisms cannot be essential, as they could change due to various circumstances. Therefore, as this example has shown, the exterior marks might be misleading. We agree with the notion that the identification on the grounds of morphology is very important, and we do not want to devalue this particular method, but is seems obvious that only morphology is not sufficient. What follows is the examination of the taxonomic classification of the aesculapian snake and the lizard slow worm.

Kingdom: *Animalia*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Class: *Reptilia*
Order: *Squamata*
Suborder: *Ophidia*
Family: *Colubridae*
Genus: *Zamenis*, Fitzinger, 1833
Species: *Z. Longissimus,* Laurenti, 1768

Kingdom: *Animalia*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Class: *Reptilia*
Order: *Squamata*
Suborder: *Sauria*
Family: *Anguidae*
Genus: *Anguis*, Linnaeus, 1758
Species: *A. Fragilis*, Linnaeus, 1758
(Kryštufek and Janžekovič 1999)

As we can see from the above classification, not only do the organisms belong to different species, they also belong to different families, and, taking it even further, according to the Linnaean hierarchy, also to different suborders. If morphological marks are not essential for a species, then the essence must be something else.

Another example is variation among species. Map butterfly (*A. Levana*) have the very interesting characteristic. His wing colour and also pattern varies and these variations are dependant on the time of their birth. Those who are born in summer have a different colour than those who are born in spring (Fric and Konvička 2002: 1018).

The examples chosen are relatively simple. We can quite easily distinguish the slow worm from a snake. There are also organisms where identification according to morphological marks is almost impossible. Such species are the so-called cryptic species. Mayr defines that: "these species show the same genetic, behavioral, and ecological differences from traditional species as do phenotypically different species but do not possess the traditional taxonomic differences (Mayr 2001: 182).

That is why natural kinds must have properties that are not shared with other kinds, and this, according to the example of cryptic species (at least what exterior marks is concerned), seems not to be true.

For example, cryptic species are "very common in mycology" (Piškur 2010: 341). If these properties could be shared with other species, then these properties cannot be essential for the species.

Let's look what Piškur says:

> To unravel the morphologically identical or the hard to discern complex of species we use an approach that is not based only on the comparison of nucleotide sequences of one region (e.g. of the rDNA region), but also incorporates analyses of other sections of the genome (for example, genes for elongation factor 1-a, calmodulin, -tubulin). (Piškur 2010: 341)

Devitt suggests a certain 'underlying intrinsic' properties of organisms as the essence of a species, and at the same time states that this could be the genetic property of an organism. Therefore, we can claim that the genetic properties of organisms are a good candidate for the essence of a species, since, as it is demonstrated by the example with snake and lizard, the exterior marks of an organism may be misleading when we want to identify organisms.

Let's try to verify Devitt's thesis by using an example from the field of chemistry, i.e. an example regarding the essence of chemical elements.

The number of protons is that which determines the chemical properties of an element. So we are trying to find something that can identify a species and at the same time fulfils the same conditions as the essence of chemical elements: it provides essential properties.

Analysing an example from biology that can substantiate this thesis:

According to the American Museum of Natural history scientists compare the DNA between organisms:

> The chimpanzee and another ape, the bonobo, are humans' closest living relatives. These three species look alike in many ways, both in body and behavior. But for a clear understanding of how closely they are related, scientists compare their DNA, an essential molecule that's the instruction manual for building each species (American Museum of Natural History 2018)

When scientists analyse DNA sequences of different organisms they also learn about how organisms are related, which gives us more information about the relationship than about morphology (Murnaghan 2018).

Some research shows that different models can help us identify species. "A model COI profile, based upon the analysis of a single individual from each of 200 closely allied species of lepidopterans, was 100% successful in correctly identifying subsequent specimens" (Hebert, Cywinska, Ball, and deWaard 2003: 313).

5. *Conclusion*

In this article, we tried to analyse Devitt's 'intrinsic biological essentialism'. The problem of essentialism regarding species remains one of the central topics in philosophy of biology. If we can recognize that kinds in sciences, such as chemistry, have an essence or essential properties, then this recognition could be translated into other scientific fields—in this case, biology. We leaned on Devitt's idea that species "have essences that are, at least partly, underlying intrinsic, mostly genetic, properties" (Devitt 2008: 344). If we can determine essence in chemical elements, then we can determine essence in species. The fact is that due to the increasing advancement in technology more focus is put on genetics and genetic research, and this determines whether organisms are related or not. When genetic research shows that organisms are related, this means that they have some characteristics that all members of the group share. These characteristics are probably one of the essential properties of organisms, because these properties define a species and classify the organisms to that particular species. If essential properties are still unknown to us that does not mean that they do not exist. There remains a possibility that due to advancements in technology we will be able to find them and this could either confirm or reject Devitt's idea about essence. Nevertheless, the already mentioned idea that species have essence which is based on genetic properties seems to have the most merit.

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