Review of Filip Jaroš’s dissertation

„The ecological and ethological significance of felid coat patterns (Felidae)“
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In his dissertation Filip Jaroš examines the validity of several biological theories which attempt to explain the occurrence, the specific patterns and colours of the coats of felid species in respect to their ecological significance. These theories are mainly the original idea of camouflage-patterns put forward by Alfred Russel Wallace (1879), the theory of expression of antagonistic forces by Hingston (1933), the theories put forward by Cott (1940), Eaton (1974), Ortolani & Caro (1996), and the doctrine of biological self-expression developed by Adolf Portmann (1967).

We can roughly group these approaches as either functionalistic (in the theories of adaptive coloration the phenotype has a survival value of some sort) or eidetic (the phenotype is the visual expression of the specific individuality of a given species and also a given specimen). Most of the functionalistic accounts classify, as Jaroš rightly observes, as „evolutionary just-so-stories.“ Here lies the goal of his dissertation: How can these just-so-accounts be evaluated?

In brief, the question of the dissertation is: Do felid coat patterns convey an ecological and hence evolutionary advantage in terms of camouflage, aggressive expression or intraspecific communication – or do they rather exist without a strong relation to functional values? To achieve his goal, the author, with an abundance of details, presents the host of functional accounts of felid coat phenotypes having come up in the history of biology. He then discusses these doctrines in the framework of current ecological work on animal coat patterning which follows the approach of evolutionary ecology.

Jaroš then follows a second, not only theoretical, but also empirical and statistical approach: The bunch of his work consists in a meticulous testing of the discussed paradigms. To accomplish that endeavour, the author scrutinizes coat samples of all felid species, preserved and alive in museum collections and zoological gardens. He then submits the specifics of their coat patterns to a variety of statistical tests concerning the affordances of the various biotopes the species roam in the wild. This is a precious example of a work long overdue in evolutionary ecology.

We have to concede that it is much needed to test the assumptions of biological functionalism against reality. This kind of task has not been carried out very often so far, obviously because of the high degree of scrutiny and dogged work needed. But in many cases the accounts of evolutionary logic have the tendency to become circular just-so-stories that go more or less as follows: „As every feature in the phenotype must have a function, and the most important functional tool for a predator is that which conveys the ability to stalk his prey, the function of the fur coat only can be camouflage.“
Here Filip Jarůš could prove that nearly none of the current functional explanations withstands statistical-empirical tests. The outward appearance of a felid is governed to a much lesser degree by functional needs than has been presupposed so far. We should therefore wish for a lot more of those in-depth-studies taking care of specific functional stories of evolutionary science.

In the course of his findings Filip Jarůš also shakes a bunch of other – rather simple, but crucial – explanations usually taken for granted in ecology and ethology. E.g. what role does the visual sense – dominant in primates like us, but at most secondary in carnivores and their prey – play at all? Can a scientific discussion start with an anthropomorphism biased from the beginning? The author observes – still rather rhapsodically –, that as all the differently coloured cats predominantly hunt in the dark, colours might be of no importance at all. Their fur-pattern might have the same functional status as the inner colouration of a nautilus cephalopod’s shell, or the colours and forms on the wings of nocturnal moths, invisible in the night (Sebald 2001).

Filip Jarůš’s approach at these points reminds of a famous case of recent re-evaluation of evolutionary paradigms: the story of the adaptational value of colour in the peppered moth Biston betularia (Majerus 1998). Following the studies of Kettlewell it has become customary for decades to explain the pressure of selective forces with the example of the whitish moth, which supposedly settles on pale tree stems, and which was accompanied by a melanistic variant occurring in an extremely small percentage. It has been stated by biologists – and hence taught even in middle school as an example in kind – that following the rapid industrialization the melanistic variant took over to a proportion of over 90 percent due to the fact that on soot covered trees the white form was easily spotted by birds and preyed upon. The work of Majerus (1998) has shown the various flaws in the original account. No simple selectional forces were at work here.

It is somewhat a missed opportunity that Filip Jarůš did not elaborate deeper on this classical example of a failed functionalist interpretation of the phenotype. He could have (and, for reasons of scientific accuracy in the general discussion on that topic, really might have) enlarged the argument to a more general discussion including critical positions assessing a mere functionalist approach (e.g. Rose & Rose 2000, Gould & Lewontin 1979). There are many other examples which slowly become unburdened from an excessively rigid account of evolutionary necessity (e.g. the story of the blue tit which to feed sufficiently has to take in an aphid every two seconds, or the practive to call big mammalian predators “efficient hunters” energy-wise (for a deconstruction see Vermeij 2004). It is rare that a scholar is applying so much accuracy and thoughtfulness on the testing of theoretical-evolutionary accounts as Filip Jarůš has done in his work. A combination of this empirical depth with a broader argument in the discussion of functionalism in evolutionary theory therefore could have been even more beneficial to the work.

In this context, it is to great merit that Filip Jarůš has introduced Adolf Portman as a morphological biologist whose insights can be of interest to the discussion of issues in functionalist positions of...
biology. He here strengthens a stream of thought in recent discussions which tries to re-integrate the Portmann approach of self-expression into current notions of survival-value (Kleisner 2008).

The author is re-evaluating functionalist explanations of the evolutionary ecological role of phenotypes from angles normally not represented in this discussion. On one hand, he offers a deep-going and thorough statistical evaluation, and on the other hand, he provides an alternative account of body shape which has promising links to the broader continental biophenomenological tradition and which could lead out of some impasses of functionalism. Even the ideas of Portmann – namely his theory of taxonomical rank by the degree of cephalisation – are submitted to statistical testing by the author (and prove to be not corroborated). It possibly could have been of some use to enlarge the perspective on Portmann to an even broader discussion of notions of body shape and colour outside functionalistic biology, following notably Langer (1953) or Maturana and Varela (1980).

Summing up the details, the work shows a base of meticulous empirical and statistical practice, leading to the intriguing finding that one of the big paradigms of classical evolutionary ecology, the felid-fur-as-camouflage-function, cannot be proven and might rather have the status of an evolutionary myth. This is a far-reaching scientific finding which opens up promising vistas of follow-up-research, possibly broadening into a more philosophically informed discussion of the status of functionalism in ecological realism.

I consider the Filip Jaroš’s dissertation suitable for the defense. Its quality fulfills the criteria necessary for obtaining the Ph.D. degree.

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References:

All from the dissertation, except:


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