A revolution? We think knot!

In January the UK interviewed ecologist Theunis Piersma on his new insights concerning evolutionary biology. But evolutionary geneticists Corneel Vermeulen and Kim Meijer don't believe in the revolution Piersma promised. "We deplore that they apparently felt it necessary to call the modern synthesis into question without putting forward any compelling arguments."

An article published in the UK on 13 January 2011 caught our attention. The article, entitled "The genes didn't do it; Red knots bring revolution in biology", was written by René Fransen on the occasion of the publication of *The Flexible Genotype*, a book written by Theunis Piersma (sometimes called the nemesis of the Modern Synthesis of evolutionary biology) and Jan van Gils.

The article promised a challenge to the current dogma that would cause an explosion in biology. Naturally, as evolutionary biologists, we were curious to learn what this impressive new insight was. The article starts with the observation that, during their annual migration, red knots change in morphology and physiology in response to certain environmental cues.

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Piersma states: "Genes simply produce bodies that are flexible enough to rapidly respond to changing circumstances. These changes in behaviour may ultimately lead to changes in genes." He adds, "genes don't drive change, they respond."

This last statement is rather cryptic. The phenomenon of a single genotype producing a variety of different phenotypes in response to the environment is known as phenotypic plasticity and has been subject to investigation for decades. This cannot be Piersma's new insight.

We therefore read the book and discovered that only the last chapter deals with evolutionary aspects. According to this chapter, we have been seriously underestimating the role of phenotypic plasticity in evolution. The authors claim "Phenotypes change first and genes follow," which, they say, is in sharp contrast to the modern synthesis that states that "genes change first and that phenotypes follow".

So are we really dealing with a new insight that will cause a revolution in biology? We think not. The idea is not new but was proposed by James Mark Baldwin back in1896 and is known as the 'Bald-

So will it cause a revolution by forcing changes in the modern synthesis? If we consider adaptive evolution according to the modern synthesis, within any population of a given species we encounter genetic differences caused by undirected mutations in the genes. Together, the genotype of an individual and the individual's environment give rise to its looks and behaviour (phenotype).

Natural selection occurs when some phenotypes have higher reproductive success than others, allowing these individuals to increase their genetic share in the next generation. Note that natural selection acts on the phenotype, so it is incorrect to say that in the modern synthesis genes change first and phenotypes later: they change in concert. Evolution occurs only if the superior phenotypes are heritable, i.e. have a genetic basis.

The phenomenon that Piersma and Van Gils describe is superficially different. If a population is confronted with a new environment, individuals adjust their phenotypes non-genetically (phenotypic plasticity). Only thereafter will the individuals that do so most effectively assimilate the phenotypic change genetically by natural selection.

Is this scenario sufficiently different to warrant changing the modern synthesis? Not really. The process that Piersma and Van Gils describe is interesting, but completely consistent with the modern synthesis. It is one possible scenario among many.

Concluding, the authors deserve praise for writing an excellent overview of phenotypic plasticity by integrating aspects of ecology, physiology and behaviour. The authors concede that evolution plays a major role in shaping the phenotype and have dedicated a chapter to this. However, eleven pages do not suffice to capture the full complexity of evolution playing out in all aspects of a phenotype.

The authors have not developed a novel insight and we deplore that they apparently felt it necessary to call the modern synthesis into question without putting forward any compelling arguments for this. Apparently, the gap between ecologists and (evolutionary) geneticists is still great. We rejoice in the growing attention of ecologists and hope that evolutionary biology will soon be constructively integrated into the authors' views.

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