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Wolf-Ekkehard Lönnig

26 July and 8 August 2018

The Deceptive Flowers of
Orchids
and Evolution by Natural Selection

Or How More than Eight[1] Thousand Beautiful Facts are Slaying an Ugly Hypothesis[2]: Darwinism[3]

Part I

"The progress of evolution walks over **billions of corpses**."[4]
Ludwig Plate

"I believe natural selection represents **a truly hideous sum total of misery**."
"We understand that we are here as a result of **a truly hideous process**.
Natural Selection is **an ugly process** that has beautiful consequences."
Richard Dawkins

"The evolutionary process is rife with **happenstance, contingency, incredible waste, death, pain and horror**."
David Hull

"Namely, **selection** is the blindest, and **most cruel way of evolving new species**, and more and more complex and refined organisms … The struggle for life and elimination of the weakest is **a horrible process**, against which our whole modern ethics revolts…"
Jacques Monod

The whole of organic nature on our planet exists only by **a relentless war of all against all**.
Ernst Haeckel

According to Darwinism, the origin of species is the result of
"**primeval stupidity and original brutality**" ("**Urdummheit und Urbrutalität**"
for random mutations and the elimination of the weakest by natural selection).
Anton Neuhäusler[5]

Instincts are the "consequences of one general law leading to the advancement of all organic beings, - namely, multiply, vary, **let the strongest live and the weakest die**."
However, "If it could be proved that **any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate my theory**, for such could not have been produced through natural selection."
"Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each."
Charles Darwin

A famous Darwin enthusiast ("evolution is not a theory; it is a fact") on the pollination of orchids:
"It's **hard to imagine how evolution has produced such a complex combination mechanism**."[6]
Sir David Attenborough

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[1] The species numbers given for the orchid family range between 25,000 and (mostly) 30,000 – of which 1/3 are non-rewarding. I chose the minimum number.

[2] Reformulating Huxley's "[T]he great tragedy of Science – the slaying of a beautiful hypothesis by an ugly fact." See: http://www.weloennig.de/PlantGalls.pdf

[3] "Darwinism" is (again) an abbreviation used here (and by many further authors) synonymously with "neo-Darwinism", or "The Modern Synthesis" and the "Synthetic Theory of Evolution" with its main focus on "omnipotent" natural selection. For some reasons regarding terms, see please http://www.weloennig.de/BegriffNeodarwinismus.html

[4] Original German sentence: "Der Fortschritt der Evolution geht über Milliarden von Leichen."

[5] https://de.wikipedia.org/wiki/Anton_Neuhäusler

[6] Context: The bee coming from the male flower "no doubt somewhat dazed, flies away and maybe thinks it's not going to do that again, but is nonetheless attracted to another rather different looking flower, which is the female but which produces just that sort of scent and it sticks its head into the female flower and this little bundle of pollen ***like a key fits into a little aperture like a lock*** and it pulls off the pollen and leaves on the bees back a little bundle and lo and behold pollination has been achieve**.** It's hard to imagine how evolution has produced such a complex combination mechanism." As to his example of the comet orchid, see, please, below.

Preface

With reference to Thomas Huxley's verdict "*[T]he great tragedy of Science – the slaying of a beautiful hypothesis by an ugly fact*", I had formulated the subtitle of my article about **Plant Galls and Evolution** "*How More than Twelve Thousand Ugly Facts are Slaying a Beautiful Hypothesis: Darwinism*". Now, how is it possible that – in contrast to the series of the words of the neo-Darwinian authors just quoted, the same or other protagonists of the Synthetic Theory also emphasize the very opposite, viz. natural selection reflecting "*both the beauty and the brilliance in its omnipotence to explain the myriad observations of life*"[7]? It appears to be their faith that this ugly process "*explains*" in Ernst Mayr's words, "*the adaptedness and diversity of the world solely materialistically*. […] *Every aspect of the "wonderful design" so admired by the natural theologians could be explained by natural selection*." Also: "…*Darwin's theory of natural selection made any invocation of teleology unnecessary*."[8].

If, however, the entire scheme is not only doubtful but "annihilated" (in Darwin's words) by the biological facts presented for the plant galls, and, on a different level, additionally by the orchids, not only the method of natural selection – as cited above – is "ugly" (including the sense of being inadequate), but also the entire theory. In the ensuing discussion I have repeated the following key point at appropriate places to, I hope, reinforce that conclusion.

Charles Darwin (1859): "Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each. No organ will be formed … for doing an injury to its possessor. If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous." – "Darwin…discussed at great length the evolution of fruits and flowers, **showing how traits that benefit animals first and foremost to increase plants' own reproductive success"** (Bronstein 2015, p. 12[9]). Now, ***the exact opposite is true in some 10,000 orchid species: no benefit for the animal pollinators*** **and selective disadvantages for both of them, the non-rewarding orchid (displaying lower pollination rates) and the pollinator (suffering fitness costs).**

Thus, because in my view not only the method of natural selection but also the entire theory is largely insufficient and orchids are beautiful, I have now chosen the subtitle: "*How More than Eight Thousand Beautiful Facts are Slaying an Ugly Hypothesis: Darwinism*".

Studying carefully the *pros* and *cons* of the following text, it is of course up to the reader whether she will follow the inference that the limitations of the selection theory has thus also been corroborated by the study of orchids – their flower structures and especially their pollination systems – rewarding as well as non-rewarding (for the latter, Darwin commented that "***we cannot believe in so gigantic an imposture***", but this "imposture" has been established now by rigorous empirical research of perhaps thousands of authors during more than 150 years beyond any reasonable doubt).

If correct, this is especially revealing in view of the fact that Darwin wrote his book on the orchids three years after he had published the *Origin* in order to confirm/verify/substantiate his theory of natural selection (for references, see please, the text), of which he asked and asserted:

> "What limit can be put to this power, acting during long ages and rigidly scrutinising the whole constitution, structure, and habits of each creature, — favouring the good and rejecting the bad**?** ***I can see no limit*** to this power, in slowly and beautifully adapting each form to the most complex relations of life."

However, there seem to be more limits than he and his followers could image. As for the topic of intelligent design, I would like to discuss it in the second part of that article.

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[7] Christopher Exley (2009): Darwin. Natural selection and the biological essentiality of aluminium and silicon. *Trends in Biochemical Sciences* **34**: 589-593.

[8] Mayr, E. (2000): Darwin's Influence on Modern Thought; Scientific American July 2000, pp. 66-71.

[9] Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.

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Just a first glance on orchid beauty in harmonious diversity and compexity

The photos on the three preceding pages present nothing but a first glimpse on orchid beauty in harmonious diversity: “In my examination of orchids, hardly any fact has struck me so much as the endless diversities of structure – the prodigality of resources – for gaining the very same end, namely, the fertilization of one flower by pollen from another plant” (Darwin).

See, please, at the end of the article the names of the genera as well as iteration of the photographs followed by magnification in roughly the same sequence and there are also some photos of additional genera. All photographs by Wolf-Ekkehard Lönnig, June and July 2018.

An Inner Contradiction

So, according to the Darwinian authors[10] just quoted above, — by the '*ugly*' and '*truly hideous*' and '*horrible process*' *of* ***natural selection***, '*the blindest, and most cruel way of evolving new species*', – by the '*original brutality*' (Urbrutalität) of a '*perpetual*', '*relentless war of all against all*' (*letting the miniscule minority of the strongest live and the billions of the weakest mercilessly die*) and through the sheer '*primeval stupidy*' (Urdummheit) of random micro-mutations[11], a *progress of evolution, walking* '*over billions of corpses*' by '*happenstance, contingency, incredible waste, death, pain and horror*', — nature achieved the essence, the embodiment, the epitomy of '*beautiful consequences*', namely life's "***endless forms most beautiful and most wonderful***, which have been, and are being, evolved" (in Darwin's final words of the *Origin*[12]), and all this in the absolutely abominable manner just quoted.

Many authors cannot help but sense an utmost contradiction, i. e. an enormous inner conflict, inconsistency and illogicality, a total *non sequitur* between this Darwinian evolutionary method consisting, to emphasize this point again, of ***primeval stupidity*** *and* ***original brutality***, of *incredible waste, death, pain and horror* and the **totally unexpected result consisting of life's 'endless forms most beautiful and most wonderful**'.

Or in one word: There is an immense tension, inadequacy and deficiency between the inifinitely ugly causes (*unfathomable* stupidity and *unrivalled* brutality) and the unspeakably beautiful and most wonderful effects they are thought to have produced – the exquisite complexity of living beings – specified and to a large part irreducible.

Solving the Contradiction

(a) Darwin's relevant falsification criteria

As has already been emphasized in my paper on *Plant Galls*[13], in contrast to most of his modern disciples, Charles Darwin formulated some clear and unmistakable falsification criteria for his theory of natural selection. His following statement (Origin 1859/1872[14]) was highly relevant for our *Plant Galls* article (emphasis in the following quotations regularly added):

> "Natural selection cannot possibly produce any modification in a [1859: in any one] species exclusively for the good of another species; … ***If it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate my theory***, for such could not have been produced through natural selection."

However, Darwin continues (1859/1872):

> "Although many statements may be found in works on natural history to this effect, **I cannot find even one which seems to me of any weight**." …

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[10] Except Neuhäusler.

[11] As for a definition and application of the term "micro-mutation" *cf.* Google (32,500,000 hits 16 July 2018). Check also Google Scholar.

[12] Full quotation of Darwin (1872): "Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved." (In the first edition of 1859 the words "by the Creator" are missing.

[13] http://www.weloennig.de/PlantGalls.pdf

[14] http://darwin-online.org.uk/Variorum/1866/1866-241-c-1859.html

As “to this effect”, he seems to have missed plant galls – although he had studied of the phenomenon himself, especially near the end of his life and had mentioned it several times in the *Origin*[15].

At present, however, this criterium cannot be applied to the non-rewarding orchids and their deceived pollinarors, because – to fulfill this criterium – the pollinator animals would have to display structures and/or deviating behaviours “formed for the exclusive good of another species”, the respective orchids. Yet, as far as I know, nobody has focused his attention especially on this question, but it could be, perhaps, a research project inspired by ID, first concentrating on individual behaviours differing on the flowers of sexually deceptive orchids in contrast to the normal precopulatory and copulatory procedures under regular/typical conditions (not to be expected even under the assumption of a long **co-evolution** between orchid and pollinator).

> **Darwin additionally**: “Natural selection can produce nothing in one species for the exclusive good or injury of another; though it may well produce parts, organs, and excretions highly useful or even indispensable, or again highly injurious to another species, ***but in all cases at the same time useful to the possessor***.”

On natural selection, Darwin also added in all six editions of the *Origin of Species* (with very slight variations between 1859 and 1872) the ensuing qualification[16]:

> “Natural selection will never produce in a being **anything injurious to itself** (1872: “any structure more injurious than beneficial to that being”), for ***natural selection acts solely by and for the good of each***. No organ will be formed, as Paley has remarked, for the purpose of causing pain or for doing an injury to its possessor. If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous.”

So, let us apply the test criteria that [a] “*Natural selection will will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each*” and [b] “*no organ will be formed…for doing injury to its possessor”* [c] “*If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous*” now **to the deceptive flowers of orchids and their pollinators**, constantly keeping in mind and reflecting now on these of Darwin’s falsification criteria, the most far-reaching key points of which I’m going to repeat at appropriate places in the following form[17].

Charles Darwin (1859): “Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each. No organ will be formed … for doing an injury to its possessor. If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous.” – “Darwin…discussed at great length the evolution of fruits and flowers, **showing how traits that benefit animals first and foremost to increase plants’ own reproductive success”** (Bronstein 2015, p. 12[18]). Now, ***the exact opposite is true in some 10,000 orchid species: no benefit for the animal pollinators* and selective disadvantages for both of them, the non-rewarding orchid (displaying lower pollination rates) and the pollinator (suffering fitness costs).**

(b) ‘Survival of the Trickiest’

“*DECEPTIVE ORCHIDS – Survival of the Trickiest*”[19] was the title of an event from February 14 to March 19, 2016, of the *Myriad Botanical Gardens* in downtown Oklahoma City, Oklahoma[20]. Official explanation: “Orchids rarely play by the rules. They are like the thieves, cheats and pirates of the plant kingdom, taking advantage of the natural systems of cooperation and ***using them for their sole benefit***. Though orchids make up one of the largest and most diverse families of plants, one thing that unites them across the globe is their tendency towards deception.”

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[15] See, please, the details for plant galls in http://www.weloennig.de/PlantGalls.pdf and for Darwin’s studies of orchids http://darwin-online.org.uk/content/frameset?itemID=F803&viewtype=text&pageseq=1

[16] Compare http://darwin-online.org.uk/Variorum/1859/1859-205-c-1872.html

[17] *Repetitio est mater studiorum* (Repetition is the best teacher).

[18] Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.

[19] https://www.yelp.com/events/oklahoma-city-deceptive-orchids-survival-of-the-trickiest

[20] https://en.wikipedia.org/wiki/Myriad_Botanical_Gardens

David Horak[21], curator of orchids at the *Brooklyn Botanic Gardens*, generally states on orchid pollination (and we may raise the question whether the productions of natural selection are really "***in all cases at the same time useful to the possessor***"):

> "Orchids commonly use nectar to entice their pollinators, but they also employ color, shape, or fragrance, and even mimic the flowers of other plants. Color is often important for animals active during the day. For example, orchids pollinated by hummingbirds and butterflies tend to have red, orange, or pink tubular—but not necessarily fragrant—flowers. They frequently have yellow blotchy patterns to mimic the anthers and pollen of the other plant types visited by these nectar lovers, ***but this mimicry is deceptive because the orchids often offer no nectar reward***."

Also, apart from Darwin and perhaps some of his disciples of the past ("***we cannot believe in so gigantic an imposture***" – Darwin[22]), all the other orchid researchers so far known to me (from exploring undergraduates to renowned biology professors, from private orchid enthusiasts to fact-finding freelance writers, from Christian Konrad Sprengel's "Scheinsaftblumen"[23] (1793)[24] to Sir David Attenborough's documentaries[25] (2007: **320.218 viewings** up to **14 June 2018**) and many other investigators (often by their own independent orchid investigations up to the present day), are all in agreement with this statement that orchids "***often offer no nectar reward***" – just to quote several confirmatory examples (including the papers given in the author's reference lists as well as their citations – ***all based on rigorous empirical research*** – more than 1,000):

Emily Horton (2018, p. 3)[26]:

> "Many orchids, ***up to one third of all known species, offer no reward to pollinators*** (Case & Bradford, 2009). These orchids are referred to as **non-rewarding species, or as food deceptive orchids** (Case & Bradford, 2009). *Cypripedium pubescens* is, in fact, considered a **food deceptive orchid**: its pouch shaped structure acts as a trap to temporarily imprison pollinators (Case & Bradford, 2009). Interestingly, it has also been shown that the deceptive pollination strategy employed by many orchids may result in high levels of pollen limitation (Walsh, 2014)."

Kenji Suetsugu (2018, pp. 1498/99)[27]:

> "[T]he goal of the present study was to investigate the pollination ecology of the achlorophyllous orchid "*Gastrodia pubilabiata* (Fig. 1), which, throughout its life history, fully depends on saprotrophic fungi (Kinoshita et al. 2016), to which it appears to provide ***no reciprocal benefit***. Similar to its

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[21] https://www.bbg.org/gardening/article/orchids_and_their_pollinators (retrieved 5 June 2018)

[22] Darwin C R (1862, p. 46): On the various contrivances by which British and foreign orchids are fertilised by insects, and on the good effects of intercrossing. London: John Murray. http://darwin-online.org.uk/content/frameset?pageseq=1&itemID=F800&viewtype=text
(In this work, he refers 14 times to C. K. Sprengel, "a most careful observer" (p. 45); and on p. 3 he comments: "I must premise that Christian Konrad Sprengel, in his curious and valuable work, 'Das entdeckte Geheimniss der Natur,' published in 1793, gave an excellent outline of the action of the several parts in Orchids;"). He repeated his statement that "we we cannot believe in so gigantic an imposture" in the second edition of the book (1877) and he tried hard and worked literally day and night to find nectar in such "sham-nectar-producers": "Notwithstanding these several facts I still suspected that ***nectar must be secreted by our common Orchids***…" (p. 38) http://darwin-online.org.uk/converted/published/1877_Orchids_F801/1877_Orchids_F801.html

[23] "Scheinsaftblumen": I have to admit that I was much amused about that term/expression, which Darwin, as mentioned above, has translated "sham-nectar-producers".

[24] According to Darwin (1862, p. 45/1877, p. 36) referring to J. G. Kurr, possibly already by Johann Georg Krünitz (1774?): "…nor could Krünitz find nectar either in the nectary or on the labellum of *O. morio, fusca, militaris, maculata*, and *latifolia*. I have looked to all the species hitherto mentioned in this work and could find no signs of nectar;" Krünitz: Oeconomische Encyclopädie; vol. 4, http://www.kruenitz1.uni-trier.de/. So far I could not validate this reference in Krünitz. Neither is Kurr quoting Krünitz on p. 28 (according to Darwin's reference). However, Darwin underlined in Kurr's book of 1833, p. 139, an important point, which seems to be somewhat in agreement with his falsification criterium as quoted above: "…denn Alles in der Natur hat einen Selbstzweck und ***Nichts ist blos um eines Anderen willen vorhanden***." https://www.biodiversitylibrary.org/item/105598#page/149/mode/1up

[25] https://www.youtube.com/watch?v=-h8I3cqpgnA (retrieved 13 June 2018)

[26] Horton E (2018): Creating a predictive model for flowering of Virginia Orchid, Cypripedium pubescens. Lynchburg College. https://digitalshowcase.lynchburg.edu/cgi/viewcontent.cgi?article=1060&context=utcp

[27] Suetsugu K (2018): Achlorophyllous orchid can utilize fungi not only for nutritional demands but also pollinator attraction. *Ecology* **99**: 1498-1500. https://www.researchgate.net/profile/Kenji_Suetsugu/publication/324000665_Achlorophyllous_orchid_can_utilize_fungi_not_only_for_nutritional_demands_but_also_pollinator_attraction/links/5ac2f157a6fdcccda65f87ac/Achlorophyllous-orchid-can-utilize-fungi-not-only-for-nutritional-demands-but-also-pollinator-attraction.pdf?origin=publication_detail

> congener *G. similis* (Martos et al. 2015), ***the flowers of G. pubilabiata provide no reward***, either in the form of nectar or edible pollen grains, and the species, instead, deceptively attracts *Drosophila* pollinators that usually lay their eggs in fermented substrates, such as fermented fruits and decaying mushrooms (Suetsugu and Kato 2014)."

Spyros Tsiftsis and Vladan Djordjevic (2018, p. 1)[28]:

> "The pollination success of two nonrewarding orchids in two coarse habitats was examined." […] "The family Orchidaceae, with approximately 27,000 species (Govaerts, 2016), is characterized by a remarkable diversity of floral forms, an enormous diversity of pollination mechanisms and (compared to other plant families) by an ***unusually high occurrence of nonrewarding flowers*** (van der Cingel, 1995; Jersáková et al., 2006)."

B. C. Vieira et al. on two species of *Epidendrum*, *E. secundum* and *E. denticulatum* (2017, pp. 497, 501)[29]:

> "Results showed that *E. secundum* and *E. denticulatum* ***are rewardless***, self- and inter-compatible, and need a biotic vector for pollen transfer."
>
> "[H]istochemical tests were negative for nectar, lipids and starch, suggesting ***both species release no fragrance and offer no reward to pollinators***. Also, although the cuniculus of both species has a papillous epidermis (Fig. 1c, e), no nectar secretion was detected, even in *E. denticulatum* where these papillous epidermal cells are much more evident compared with *E. secundum* (Fig. 1 *d, f*).
> with *E. secundum* (Fig. 1d, f)."

Ryan P. Walsh et al. (2014, p. 2)[30]:

> "Many orchids rely on a deceptive pollination strategy, a pollination strategy in which the flower provides floral cues indicating a food reward ***while not providing that reward*** (Faegri and van der Pijl 1971; Cozzolino and Widmer 2005). Deceptive pollination systems often show lower visitation and pollination relative to rewarding relatives (Nilsson 1980, 1984)."

Marbel Soto Gomez (2013, without page numeration)[31]:

> "One third of all orchids have evolved features that are ***perceived*** **as rewards** by pollinators, ***but do not end up materializing*** (Roberts & Dixon 2008). Species from the Mediterranean group *Ophrys* use sexual deceit to achieve pollination by tricking the males of a specific type of bee (Schiestl et al. 1999). To the surprise and awe of countless naturalists, *Ophrys* flowers remarkably mimic the appearance of receptive female bees."

Doron Hirschberg (DVD about *Wild Orchids of Israel*; 2009: **131.910 viewings** up to **14 June 2018**)[32]:

> "Suddenly these yellow pollinia attach to one of them [of the two struggling male insects] – ***a success for the orchid, but no satisfaction for the bee*** assists with this hopeless mating."

Rod Peacall (2007, homepage: Australian National University, Canberra)[33]:

> "The great majority of animal pollinated plants secure the services of their animal pollinators by providing food rewards such as nectar or pollen. ***However, orchids are exceptional in that perhaps as***

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[28] Tsiftsis S and Djordjevic V (2018): Habitat effects and differences in the reproductive success of *Orchis punctulata* and *Orchis purpurea* (Orchidaceae). *Turkish Journal of Botany* **42**: 1-12.
https://www.researchgate.net/publication/324172085_Habitat_effects_and_differences_in_the_reproductive_success_of_Orchis_punctulata_and_Orchis_purpurea_Orchidaceae

[29] Vieira B C, Pansarin L M, MartucciM E P, Gobbo-Neto L and Pansarin E R (2017): Pollinarium size as a hybridisation barrier between sympatric inter compatible orchids. *Australian Journal of Botany* **65**: 497–506

[30] Ryan P. Walsh, Paige M. Arnold and Helen J. Michaels (2014): Effects of pollination limitation and seed predation on female reproductive success of a deceptive orchid. *AoB Plants*: [*Annals of Plants*; Oxford University Press]
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4094650/pd f/plu031.pdf or: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4094650/

[31] Gomez M S (2013): The wonderful world of Orchid love. *The Science Creative Quaterly*: https://www.scq.ubc.ca/the-wonderful-world-of-orchid-love/

[32] https://www.youtube.com/watch?v=yFftHXbjEQA (Comment by an anonymous viewer (2016): "***How does a flower know of how a female bee looks like and smell****[s]* ***like?*** How does a plant even come up with such a scheme? ..... unless, an Ingenious Designer is at work with the nature!"). The DVD seems to be of 2009.

[33] Peacall R (2007): Pollination by sexual deception in Australian terrestrial orchids. Text and photographs by Rod Peakall http://biology-assets.anu.edu.au/hosted_sites/orchid_pollination/

many as one third of the 30,000 or so species achieve pollination by deception. That is, they lure animal pollinators to the flower by false promises of food, **but do not provide any**. Most of these species are ‘food deceptive’ falsely advertising the presence of food by bright colors and sweet scents.”

Florian P. Schiestl and Rod Peakall (2005, p. 674)[34]:

“Several hundred Australian and European terrestrial orchids exploit the mating behaviour of male insects for their own sexual reproduction (Pouyanne 1917; Coleman 1928; Kullenberg 1961; Stoutamire 1974, 1975; Peakall 1990; Bower 1996; Mant et al. 2002; Schiestl 2005). These ‘**sexually deceptive**’ orchids ***mimic the shape and, most importantly, the sex pheromone of a receptive female and achieve pollination during an attempted copulation or precopulatory routine of the cheated male insect*** (Peakall 1990; Schiestl et al. 1999, 2003).”

Kara Rogers (2011; Britannica BLOG)[35]:

“An estimated 1,000 [of the ca. 10,000 deceptive] orchid species resort to **sexual deception**, in which flowers attract pollinators by producing scents that mimic sex pheromones. A striking example of this form of deception is seen in the orchid *Chiloglottis trapeziformis*, which lures males of its pollinator, the thynnine wasp (*Neozeleboria cryptoides*), ***when it releases a compound identical to a sex pheromone normally produced by female thynnine wasps***. The males are enticed to mate with the flower, and in the process of attempting to do so, they pick up pollen from the flower and transfer it to a second plant when again lured by the pheromone-mimicking odor.”

Małgorzata Stpiczyńska et al. (2018, p. 565, 566)[36]:

“Although ***many Orchidaceae have deceit flowers that produce no reward***, the most common reward, when present, is nectar.”

“***The rewardless condition is frequent amongst orchids*** (Jersáková et al. 2006), but when floral rewards are present, they mainly occur as nectar (Dressler 1990, 1993; Davies and Stpiczyńska 2008).”

Anne C. Gaskett (2010, p. 33)[37]:

“Sexually deceptive orchids are adapted to attract ***specific male insects that are fooled*** into attempting to mate with orchid flowers and inadvertently acting as pollinators.”

Florian P. Schistel (2005, p. 255)[38]:

“A standing enigma in pollination ecology is the evolution of ***pollinator attraction without offering reward in about one third of all orchid species***. […]

The evolution of obligate deception in orchids ***seems paradoxical in the light of the typically lower fruit set than in rewarding species***. Pollination by deception, however, can reduce self-pollination and encourage pollen flow over longer distances, thus promoting outbreeding.”

Johannes Spaethe et al. (2010, p. 139)[39]:

“The orchid family is one of the largest of flowering plants with up to 30,000 species, of these ***about 1/3 are pollinated by deception***. One of the most remarkable strategies to achieve pollination ***without providing any reward to the pollinator is sexual deception***. Sexually deceptive orchids attract their pollinators by imitating the sex pheromone of receptive females. The males become attracted to the female decoy and attempt to copulate with the labellum of the orchid. During this “pseudocopulation” the pollinaria become attached to the male’s body and are transferred during further visits to other flowers of the same species.2,3 Since the sex pheromone components produced by the flower attract only males of the target species, pollen transfer is highly efficient and pollen lost low.

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[34] Schiestel F P and Peakall R (2005) Two orchids attract different pollinators with the same floral odour compound: ecological and evolutionary implications. Functional Ecology 19: 624-680 https://besjournals.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2435.2005.01010.x (retrieved 5 June 2018)

[35] http://blogs.britannica.com/2011/03/deceptive-flowers-orchids/ (7 June 2018)

[36] Stpiczyńska M, Bartosz J P, Davies K L (2018): Nectar and oleiferous trichomes as floral attractants in *Bulbophyllum saltatorium* Lindl. (Orchidaceae). *Protoplasma* **255**: 565–574. *Cf.* for further examples https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6019460/

[37] Gaskett A C (2010): Orchid pollination by sexual deception: Pollinator perspectives. *Biological Reviews* **86**: 33-75.
https://www.researchgate.net/publication/43078971_Orchid_pollination_by_sexual_deception_Pollinator_perspectives
see and listen also to https://www.youtube.com/watch?v=PEXHiBSTg8M and https://www.youtube.com/watch?v=GV0oLYLgSJs

[38] Schiestel F P (2005): On the success of a swindle: pollination by deception in orchids. *Naturwissenschaften* **92**: 255-264.
https://link.springer.com/article/10.1007%2Fs00114-005-0636-y

[39] Spaethe J, Streinzer M and Hannes F. Paulus H F (2010): Why sexually deceptive orchids have colored flowers. *Communicative & Integrative Biology* **3**: 139-141. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2889969/pdf/cib0302_0139.pdf

Anne C. Gaskett and Marie E. Heberstein (2010, p. 97)[40]:

> "Typically, floral colour attracts pollinators by advertising rewards such as nectar, but how does colour function when pollinators are ***deceived, unrewarded, and may even suffer fitness costs***? Sexually deceptive orchids are pollinated only by male insects fooled into mating with orchid flowers and inadvertently transferring orchid pollinia. Over long distances, sexually deceptive orchids lure pollinators with counterfeit insect sex pheromones, but close-range deception with colour mimicry is a tantalising possibility. […] Orchid deception may therefore involve ***accurate and species-specific mimicry of wavelengths reflected by female wasps***, and potentially, exploitation of insects' innate attraction to UV and yellow wavelengths."

Machaka-Houri et al. (2018)[41]:

> "This two-year study examined the interactions between the ***sexually deceptive orchid, Orchis galilaea***, and its pollinator *Lasioglossum marginatum*.[…] The reproductive success of *O. galilaea* under ambient conditions was ***29.3% (±2.4), compared to 89.0% (±2.1***) in plants receiving cross-pollination by hand."

Liezl Thalwitzer et al. (2018, in press)[42]:

> "Many orchids achieve **pollination by deceptive means**. Sexually deceptive orchids are pollinated by male insects, which are lured to flowers that mimic the sex pheromones and/or appearance of their female conspecifics. […] The pollinator specificity indicates that each of the male fungus gnat species was attracted to the flowers of a specific *Pterostylis* orchid. This strongly suggests that ***each of the orchid species emit a specific floral volatile, most probably resembling the sex pheromones of the female conspecifics, to lure their male pollinators***."

Michael J. Hutchings et al. (2018, p. 498)[43]:

> "Because the orchid provides **no reward for the pollinator**, there is no incentive for habituated bees to continue to visit orchid flowers, but variation in the chemical signature of the floral bouquet between plants (Borg-Karlson, 1990; Schiestl et al., 1997, 1999, 2000) and between visited and unvisited flowers (Schiestl & Ayasse, 2001) may result in more mating attempts with unvisited flowers. However, as the floral bouquet is only emitted when flowers are fresh (Nieland & Wilcock, 1995; Jacquemyn & Hutchings, 2015), pollinators are only attracted for a short period."

Joel L. Schiff (2018, pp. 50, 95 and 103)[44]:

> "Many orchids appear to imitate other life forms in nature, including, ants, birds, bees, flies, wasps, donkeys, ducks, monkeys, spiders, and even people."
>
> "About one-third of all orchid species **do not produce any nectar reward for pollinators**, which means that they have to be a bit more cunning and deceive potential pollinators either visually, by scent, or both. But ***the evolutionary success*** of non-rewarding orchid flowers and their overrepresentation in orchids ***is problematic***, as many have low rates of visiting pollinators."
>
> "Analysis from 150 species of 25 genera of orchids shows the presence of approximately 50 different compounds. **On average, an individual orchid can produce seven to ten separate compounds** that it composes to suit the pollinator."

Incidentally, as to the **specificity of these compounds**, Florian Schiestl et al. state, for instance, in a *Nature* paper (1999, p. 421)[45]:

> "We have found that flowers of *O. sphegodes* produce ***the same compounds and in similar relative proportions*** *as are* ***found in the sex pheromone of its pollinator species***, the solitary bee *Andrena nigroaenea*." These results not only challenged/definitely **disproved the earlier view** "that *Ophrys*

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[40] Gasket A C and Heberstein M E. (2010): Colour mimicry and sexual deception by Tongue orchids. Naturwissenschaften 97: 97-102

[41] https://www.tandfonline.com/doi/abs/10.1080/17429145.2018.1478005

[42] Thalwitzer L, Kelly D, Smissen R D , Butler R, Suckling D M and Ashraf El-Sayed A (2018): Species-specific male pollinators found for three native New Zealand greenhood orchids (Pterostylis spp.) suggest pollination by sexual deception. *Australian Journal of Botany*: http://www.publish.csiro.au/BT/BT17111 [Published online 4 June 2018]

[43] Hutchings M J, Robbirt K M, Roberts D and Davy A J (2018): Vulnerability of a specialized pollination mechanism to climate change revealed by a 356-year analysis. *Botanical Journal of the Linnean Society* **186**: 498–509.

[44] Schiff J L (2018): Rare and Exotic Orchids. Their Nature and Cultural Significance. Springer International Publishing AG 2018. https://link.springer.com/book/10.1007/978-3-319-70034-2

[45] Schiestl F P, Ayasse M, Paulus H F, Löfstedt C, Hansson B S, Ibarra F and Francke W (1999): Orchid pollination by sexual swindle. *Nature* **399**: 421-422. See, please, the details in https://evolutionsbiologie.univie.ac.at/fileadmin/user_upload/dep_evolutionsbiologie/Paulus/Ophrys_Nature_Artikel_1999.pdf (retrieved 16 June 2018).

> flowers produce only a set of “second-class attractivity compounds” that attract only the part of the pollinator population with a low threshold for sexual stimuli.”

Or, to take another example by Schiestl et al. in their *Science* paper (2003, pp. 437, 438)[46]:

> “The “sexually deceptive” orchid *Chiloglottis trapeziformis* attracts males of its pollinator species, the thynnine wasp *Neozeleboria cryptoides*, by emitting ***a unique volatile compound***, 2-ethyl-5 propylcyclohexan-1, 3-dione [$C_{11}H_{18}O_2$[47]], which is **also produced by female wasps as a male-attracting sex pheromone**.”
>
> “This compound proved to be **identical in orchids and wasps**. […] In contrast [to *Ophrys sphegodes* and its pollinator, *Andrena nigroaenea*, which use a unique mixture of 14 ubiquitous alkanes and alkenes to produce the signal triggering mate-finding and pollination], the Australian orchid *C. trapeziformis* and its pollinator, *N. cryptoides*, represent the opposite extreme, with the chemical signal consisting of **one unique compound**, ***requiring a rigid biosynthetic process and a highly specific receptor***: a system with seemingly limited evolutionary flexibility. Despite this, thynnine wasp–pollinated sexually deceptive orchids number about 300 species in nine genera, which suggests that the use of single and unique compounds has not hindered evolutionary diversification.”

Nicolas J. Vereecken (2009, p. 203)[48]:

> “While these orchids rely exclusively on their specialized pollinators for their own reproduction, the male insects **derive no benefit** from this interaction.”

And the phenomenon is not even limited to orchids.

Steven D. Johnson and Florian Schiestel (2016, p. 3)[49]:

> “Sexual mimicry is known to occur in hundreds of orchid species ***and has also been described recently in the daisy and iris families***.”[50]

Charles Darwin (1859): “Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each. No organ will be formed … for doing an injury to its possessor. If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous.” – “Darwin…discussed at great length the evolution of fruits and flowers, **showing how traits that benefit animals first and foremost to increase plants’ own reproductive success”** (Bronstein 2015, p. 12[51]). Now, ***the exact opposite is true in some 10,000 orchid species: no benefit for the animal pollinators*** **and selective disadvantages for both of them, the non-rewarding orchid (displaying lower pollination rates) and the pollinator (suffering fitness costs).**

Now, applying Darwin’s falsification criteria to these phenomena, could one really not conclude that the fact, the veritable truth, the indubitable reality that about ten thousand orchid species “taking advantage of the natural systems of cooperation ***using them for their sole benefit***”, i. e. “are rewardless” and thus — to state the same basic discovery in slightly different words including some additional information by the various authors quoted — , “offer no reward to the pollinators”, present “no reciprocal benefit”, providing “floral cues indicating a food reward while not providing that reward”, generating features “that are perceived as rewards by pollinators, but do not end up materializing”, being “a

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[46] Schiestl, F P, Peakall R, Mant J G, Ibarra F, Schulz C, Franke S, Francke W (2003): The chemistry of sexual deception in an orchid-wasp pollination system. Science 302: 437-438. See: https://www.researchgate.net/publication/9046826_The_Chemistry_of_Sexual_Deception_in_an_Orchid-Wasp_Pollination_System

[47] For more information on this compound, see https://pubchem.ncbi.nlm.nih.gov/compound/24861923#section=Top

[48] Vereecken N J (2009): Deceptive Behavior in Plants. I. Pollination by Sexual Deception in Orchids: A Host–Parasite Perspective. Pp. 203-222 in: Plant_Environment Interactions. Signaling and Communication in Plants. Edited by František Baluška. Springer-Verlag Berlin Heidelberg.

[49] Johnson S D and Schiestl F P (2016): Floral Mimicry. Oxford University Press, Oxford.

[50] Karremans et al. state (2015, pp. 437/438): “Food deception has evolved repeatedly in different angiosperm groups, but is mostly restricted to a few species per family (Renner, 2005), whereas estimates suggest that a third of all orchids might be food-deceptive (Ackerman, 1986), and it seems to have arisen many times independently in Orchidaceae.” *Annals of Botany* **116**: 437-455: https://academic.oup.com/aob/article/116/3/437/169626

[51] Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.

success for the orchid, but no satisfaction for the bee”, “lure animal pollinators to the flower by false promises of food, but do not provide any”, of which species the “sexually deceptive orchids [“one of the most remarkable strategies to achieve pollination without providing any reward”[52]], attract specific male insects that are fooled into attempting to mate with orchid flowers and inadvertently acting as pollinators”, “mimic the shape and, most importantly, the sex pheromone of a receptive female [either “the same compounds in similar relative proportions” or “a unique volatile compound … identical in orchids and wasps”, which deception additionally may “involve accurate and species-specific mimicry of wavelengths reflected by female wasps”] and achieve pollination during an attempted copulation or precopulatory routine of the cheated male insect”, and “when pollinators are deceived, unrewarded, ***and may even suffer fitness costs***”, as well as ***lowering reproductive success in the orchid species themselves*** — well, could one not conclude that these facts have undermined Darwin’s and the neo-Darwinian’s theory of evolution by mutation and natural selection?

Instead of applying Darwin’s falsification criteria to these discoveries, and carefully evaluating the *pros* and *cons* in relation to orchids and their pollinators, an almost endless series of evolutionary speculations have been produced, the most important of which I’m going to discuss in the following paragraphs.

(c) Evolutionary speculations

(I) Klaus Lunau and Petra Wester

Klaus Lunau and Petra Wester (2016, p. 259)[53]:

> “Floral mimicry is always beneficial for the mimic, ***but may impose costs for the deceived pollinators***.”

It clearly and definitely ***does impose costs*** – time and energy – for the deceived pollinators. And the following sentence by the authors is an example of evolutionary speculation problematic for natural selection: “Then the deceived pollinators likely evolve mechanisms not being deceived and the flowering plants to continue deception, and deception becomes trickier over evolutionary times.”

Well, in such cases, altogether some 10,000 plant species would have been involved in this circular to spiral evolutionary process: All these plants repeatedly, regularly, from A to Z, hook line and sinker, all the way down over millions of intermediate links[54], in eons of time, would eventually have been

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[52] Some quotes within quotes like transposons within transposons in a text.

[53] Lunau K and Wester P (2016): Mimicry and Deception in Pollination. *Advances in Botanical Research* **82**: 259-279. https://www.researchgate.net/publication/311895584_Mimicry_and_Deception_in_Pollination

[54] According to Darwin by “*innumerable* slight variations”, “*extremely* slight variations” and “*infinitesimally* small inherited variations” (he also spoke of “infinitesimally small changes”, “infinitesimally slight variations” and “slow degrees”) and hence imagined “steps not greater than those separating fine varieties”,”insensibly fine steps” and “insensibly fine gradations”, “for natural selection can act only by taking advantage of slight successive variations; **she can never take a leap**, but must advance by the shortest and slowest steps” or “the transition [between species] could, according to my theory, be effected only by ***numberless small gradations***” (emphasis added, see http://darwin-online.org.uk/). Basically the same view is propounded by the Modern Synthesis or neo-Darwinian theory of evolution: “**Innumerable successive small microevolutionary steps** have led to large changes in the body forms of organisms in the course of millions of years (macroevolution, concept of additive typogenesis)” (Kutschera 2015, p. 256 in Evolutionsbiologie; Eugen Ulmer; original German sentence: "Unzählige aufeinander folgende kleine Mikroevolutionsschritte haben im Verlauf der Jahrmillionen zu großen Abwandlungen in der Körpergestalt der Organismen geführt (Makroevolution, Konzept der additiven Typogenese)." And Futuyma on this theory (2016): “We must recognize that the core principles of the Modern Synthesis are strong and well-supported…”

completely successful in their evolution ***for the "exclusive good" of themselves*** and the ***definite "injury of another" species*** – in fact, the injury of hundreds if not thousands of other species: the pollinator animals.

Charles Darwin (1859): "Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each. No organ will be formed … for doing an injury to its possessor. If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous." – "Darwin…discussed at great length the evolution of fruits and flowers, **showing how traits that benefit animals first and foremost to increase plants' own reproductive success"** (Bronstein 2015, p. 12[55]). Now, ***the exact opposite is true in some 10,000 orchid species: no benefit for the animal pollinators*** **and selective disadvantages for both of them, the non-rewarding orchid (displaying lower pollination rates) and the pollinator (suffering fitness costs).**

Such a process would almost infinitely multiply the basic evolutionary problem first described by Darwin himself: for, if true, the structures of about 10,000 plant species had been formed **for the exclusive good** of themselves (to repeat "***using them for their sole benefit***", "without providing any reward to the pollinator", "may even suffer fitness costs" etc.) being superior and victorious by *"so gigantic an imposture"* in each orchid species line ***not only once but even regularly/repeatedly/tirelessly countless of times***[56] (and *"I cannot find even one which seems to me of any weight*" – but, of course, "*Darwin got it right*"[57], neo-Darwinian Nobel laureate Konrad Lorenz).

And what about the other 339,000[58] flowering plant species? Why, apart from a few exceptions (and the wind pollinated ones and some others), did they not partake in this evolutionary marathon race between cheating plants and fooled pollinator animals? Even among neo-Darwinians, "the evolution of fruits and flowers, showing how traits that benefit animals first and foremost to increase plants' own reproductive success" (Bronstein 2015, p. 12) is the generally accepted understanding for the overwhelming majority of the flowering plants – but definitely not that they are the result of an infinitely circular to spiral evolutionary race ***for the "exclusive good" of themselves*** and the ***definite "injury of another" species.*** And let us emphasize again that Darwin himself was convinced that "***we cannot believe in so gigantic an imposture***".

(II) Tufts University

One or more faculty members[59] in the science departments at **Tufts University**[60] (2001/2005, *Answers in Science*, last updated 2017[61]) are flatly denying "that any part of the structure of any one species had been formed for the exclusive good of another species", stating:

See, please, reference and additional statements by him in http://www.weloennig.de/ExplosiveOrigins.pdf, p. 5. For many further contemporary authors, see, for example, the following books http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf, p. 124, footnote 218 and http://www.weloennig.de/Utricularia2011Buch.pdf, p. 45: the authors in the main text and footnote).

[55] Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.

[56] So far, nobody has given any exact number for the "many times" – would be a speculation within a speculation without any real factual basis. See also Lönnig on *natural selection* including discussion http://www.weloennig.de/jfterrorchipmunks.pdf

[57] Original German title of the article: "Darwin hat recht gesehen"

[58] https://news.mongabay.com/2016/05/many-plants-world-scientists-may-now-answer/ Overall 369,000 species of flowering plants, minus 30,000 orchid species. All just rough numbers. See also: https://phys.org/news/2010-09-species.html and https://en.wikipedia.org/wiki/Flowering_plant

[59] The individual researchers seem to prefer to remain anonymous.

[60] https://en.wikipedia.org/wiki/Tufts_University "In 2016, Forbes ranked Tufts 12th among Research Universities, and ranked the undergraduate school 18th in its America's Top Colleges ranking, which includes military academies, national universities, and liberal arts colleges."

[61] http://answersinscience.org/about.html http://www.don-lindsay-archive.org/creation/evo_science.html (retrievd 21 June 2018)

> In "*The Origin Of Species*" (1859), Darwin said:
>
> "If it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate my theory, for such could not have been produced through natural selection." Chapter VI, Difficulties Of The Theory.
>
> ***This challenge has not been met. In the ensuing 140 years, no such thing has been found***. Plants give away nectar and fruit, but they get something in return."

In fact, **the challenge *has been met*** by the formation of plant galls in thousands of plant species, which often generate entirely new organs ***for the exclusive good of more than 132,930 animal species*** (for the details, see, please, Lönnig 2017)[62]. Inference: These 'ugly facts' have annihilated Darwin's theory *as well as all the modern versions of it*. As for the orchids, there is the open question mentioned above concerning deviating copulatory behavioral traits on the flowers compared to procedures under regular/typical conditions.

(III) Douglas J. Futuyma

In spite of the enormous amount of facts of the roughly 70,000 plant and more than 132,000 animal species just referred to, the renowned evolutionary textbook author and neo-Darwinian **Douglas J. Futuyma** (DJF) (2010, p. 4)[63] concurs with the false statement made in the name of Tufts University concerning Darwin's falsification criterium by ascertaining/contending (comments in square brackets added by me):

> "Darwin famously wrote that "If it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate my theory, for such could not have been produced through natural selection." We should notice that Darwin here illustrates the falsifiability of evolutionary theory, which some philosophers have taken to be a characteristic of scientific hypotheses [correct/commendable, but recall please here the contrast to most of the other evolutionary authors as mentioned above]. Moreover, in a world designed by a beneficent intelligent designer, we might expect to see many examples of the interspecific altruism that Darwin here denies [first, this is not a scientific statement, but more of a theological one; second, as if 70.000 examples were not already an abundant offer]. **But no one has yet provided the proof that Darwin called for**."

In view of the facts cited above, the question is almost unavoidable: ***But has really no one provided the proof yet that Darwin called for?*** So, how does Futuyma explain the phenomenon of plant galls mentioned above? So far I could find just one refererence on plant galls by Futuyma in his textbook *Evolutionary Biology*[64]. However, he does not discuss it in connection with Darwin's falsification criterium.

To return to DJF's statement that "*in a world designed by a beneficent intelligent designer, we might expect to see many examples of the interspecific*

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[62] http://www.weloennig.de/PlantGalls.pdf

[63] Futuyma D J (2010): How species affect each other's evolution. *Evolution: Education and Outreach* **3**: 3-5. https://link.springer.com/article/10.1007/s12052-010-0207-3 or PDF https://link.springer.com/content/pdf/10.1007%2Fs12052-010-0207-3.pdf

[64] Futuyma D J (1998, p. 81: Text and Figure 4.23: "…Larvae of species of the gall midge genus *Rhopalomyia* (inset) induce the formation of gall (growths) of the buds, leaves, and stems of the big sagebrush (*Artemisia tridentata*) in western North America." In: Evolutionary Biology. Third Edition. Sinauer Associates. Sunderland, Massachusetts. (So far I could not check more recent editions.) He also states (same page): "**Mutualism** should probably be called "reciprocal exploitation," **because each species interacts with the other so as to obtain some benefits**. Plants offer nectar so as to achieve reproduction via the action of pollinators; pollinators visit flowers not to help the plant reproduce, but to obtain food. Some plants "trick" pollinators into providing reproductive service without offering a resource; for example, many nectarless "pseudocopulary" orchids lure males of specific species of bees or other insects, by a flower pattern that resembles that insect species, as well as by a scent that mimics the female insect's sex pheromone. The male insect pollinates by "mating" with the flower (Color Plate 6 [p. 588 a]). Conversely, some "nectar robbing" bees and birds obtain nectar by chewing into the base of flowers, gathering food without offering the plant any benefit." W.-E. L.: I myself have often watched bumble bees doing this at the flowers of *Antirrhinum majus* biting a hole into the spur and taking the nectar. But in none of the cases Futuyma mentions Darwin's falsification criterium as quoted and discussed in the present article.

altruism that Darwin here denies”. Well, how many? And “might”? – Not so sure. But how does he know what exactly a beneficent intelligent designer should have done in constructing the plant and animal world? Anthromorphism? As mentioned in square brackets within his text above, his incursion into the mind of the designer is not a scientific statement, but more of a theological one, belonging to a category of arguments absolutely not allowed in science according to the dogmata of most neo-Darwinian authors (“*Even if all the data point to an intelligent designer, such a hypothesis is excluded from science because it is not naturalistic*” – Scott C. Todd in *Nature*[65]).

Nevertheless, DJF’s expectations on interspecific altruism are met by at least 70,000 plant species around the world producing structures – even entirely new organs – for the exclusive good of an average number of 132,930 gall-inducing insect species (the 4,700 aphid and 3,600 gall mite species and many others not included in this number[66]).

He then continues with the example of the yucca moth followed by the orchids right after the quotation given above:

> “In fact, the very opposite holds: there are countless cases in which species have evolved to “cheat” on their partners.”

Well, as to “…the very opposite [of interspecific altruism] holds”? And in all these countless cases the partners did not evolve countermeasures by the postulated billions of positive mutations and omnipotent natural selection[67] to avoid being cheated by “the preservation of [the uncheated] favoured races in the struggle for life” (Darwin[68]) in hundreds of millions of years? Is not “natural selection daily and hourly scrutinising, throughout the world, the slightest variations; rejecting those that are bad, preserving and adding up all that are good; silently and insensibly working, *whenever and wherever opportunity offers*, at the improvement of each organic being in relation to its organic and inorganic conditions of life"[69]?

So, why did natural selection not preserve and add up all those variations that were good for the deceived partners, counterbalancing and rejecting those which were bad, i.e. the mutations favouring the swindlers/deceivers/defrauders?

No wonder that Darwin concluded for the orchids that “***we cannot believe in so gigantic an imposture***” (see above) – it would have ‘annihilated’ his theory –

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[65] More about this topic in http://www.weloennig.de/Die_Affaere1.pdf
and/or Stephen C. Meyer (2009) Signature in the Cell https://www.amazon.com/Signature-Cell-Evidence-Intelligent-Design/dp/0061472786 and (2013/2014) Darwin’s Doubt https://www.amazon.com/Darwins-Doubt-Explosive-Origin-Intelligent/dp/0062071483

[66] Details and references in http://www.weloennig.de/PlantGalls.pdf - See percentages of galled plant species in: http://labs.icb.ufmg.br/leeb/publicacoes/2007_EspiritoSanto_&_Fernandes.pdf Also, one may try to extrapolate from http://www.checklist.org.br/getpdf?SL116-11

[67] For references, see please, http://www.weloennig.de/ExplosiveOrigins.pdf p. 32

[68] https://en.wikipedia.org/wiki/On_the_Origin_of_Species

[69] Darwin 1859: "It may be said that natural selection daily and hourly scrutinising, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life”: http://darwin-online.org.uk/Variorum/1860/1860-84-c-1859.html (“It may be said that…”)
Quotation from the last edition (1872) is given above. Full sentence “It may metaphorically be said that natural selection is daily and hourly scrutinising, throughout the world, the slightest variations; rejecting those that are bad, preserving and adding up all that are good; silently and insensibly working, *whenever and wherever opportunity offers*, at the improvement of each organic being in relation to its organic and inorganic conditions of life. http://darwin-online.org.uk/content/frameset?itemID=F391&viewtype=text&pageseq=1 (“metaphorically” already added in the 2nd edition of 1860):

and Lunau and Wester, as referred to above, hypothesized (2016) that “then the deceived pollinators likely evolve mechanisms not being deceived and the flowering plants to continue deception, and deception becomes trickier over evolutionary times” – thus almost infinitely multiplying the basic evolutionary problem for not only about 10,000 orchid species but also for at least ~133,000 species of galling animals, each of which would have formed structures and behaviours many times during their postulated continuous evolution for the exclusive good of themselves (“***using them for their sole benefit***”).

After briefly mentioning the yucca moth[70], Futuyma turns to the orchids:

> “Countless species of orchids, the largest family of plants, are deceitful, **offering no nectar or other reward to naïve insects**;…”

He only forgot to explain why the “naïve insects” stayed consistently and invariantly naïve for all the assumed millions of years receiving no nectar or other reward in spite of the billions of mutations and omnipotent natural selection, “which daily and hourly scrutinising, throughout the world, the slightest variations … working … at the improvement of each organic being in relation to its organic and inorganic conditions of life"? He also seems to have dismissed from his mind the question ***how*** it was evolutionary possible that ‘countless species of orchids, the largest family of plants, became deceitful’ and in contrast to that family almost all of the other 339,000 plant species were totally resistant to such evolution.

Futuyma continues to comment on the orchids:

> “…some have even evolved scents that mimic the sex pheromone of a female wasp or bee, and are pollinated by male insects that copulate with the flower.

Well, the question is, of course, ***how*** did these orchids evolve scents that mimic the sex pheromone of a female wasp or bee? Recall, please, the examples given above that such orchids “mimic the shape and, most importantly, the sex pheromone of a receptive female [either “the same compounds in similar relative proportions” or “a unique volatile compound … ***identical*** in orchids and wasps”, which deception additionally may “involve accurate and species-specific mimicry of wavelengths reflected by female wasps”] …”

Were all these species-specific functions and probably often also irreducibly complex forms gradually generated by random micro-mutations in millions of years? (For natural selection “*can never take a leap, but must advance by the shortest and slowest steps*”[71].) But how, then, did the orchid species survive all the eons of time as long as the signals for the pollinators were not strong enough to lure them into the necessary copulating actions to guarantee pollen transfer necessary for cross-fertilization of the plants?

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[70] Futuyma: “Species of yucca are pollinated by specialized moths that carefully apply pollen to the stigma of flowers, within which their offspring will feed on the resultant developing seeds. But from these pollinating species, cheating species of yucca moths have evolved several times, that lay their eggs in flowers that the “legitimate” partner has pollinated.”

[71] See long footnote above.

DJF goes on to say:

> "Such exploitation is to be expected of the fundamentally "selfish" nature of natural selection."

But why on earth does that the fundamentally "selfish" nature of natural selection not function properly in all the thousands of exploited/abused/deceived animal species in order to get rid of this deception by correspondingly counterbalancing mutations?

Charles Darwin (1859): "Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each. No organ will be formed … for doing an injury to its possessor. If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous." – "Darwin…discussed at great length the evolution of fruits and flowers, **showing how traits that benefit animals first and foremost to increase plants' own reproductive success"** (Bronstein 2015, p. 12[72]). Now, ***the exact opposite is true in some 10,000 orchid species: no benefit for the animal pollinators*** **and selective disadvantages for both of them, the non-rewarding orchid (displaying lower pollination rates) and the pollinator (suffering fitness costs).**

DJF proceeds (his brackets):

> "(We may wonder how an advocate of "intelligent design," i.e. creationism, might explain pseudocopulatory pollination.)"

Intelligent design (ID) is not identical with creationism[73]. ID starts its research from a biological object, creationism from the viewpoint of a special interpretation of the Genesis record. We are going to come back to DJF's question in Part II of the article.

DJF persues:

> "One of the major themes in contemporary research on mutualism is how it is maintained despite potential advantages to cheaters. In some cases, the dominant member may punish uncooperative partners [W-E L: So why do the wasps not punish their uncooperative ochids?]; for example, some legumes may reduce the flow of sugars to root nodules with bacteria that do not fix enough nitrogen."

"…despite potential advantages to cheaters"? Did he not just tell us that "Such exploitation is to be expected of the fundamentally "selfish" nature of natural selection", – however, without considering and applying selfish natural selection to the cheated insects counterbalancing the deception by correspondingly compensating positive mutations! Hence, could he, perhaps not better have asked how such mutualism is maintained "despite the disadvantages of deceived animals"?

Nevertheless, he inadvertently addresses a problem here (though somewhat camouflaged and convoluted): this unexpectedly 'tricky' form of mutualism – represents even a major theme of contemporary research, which has obviously not been solved during the more than 159 years since the *Origin* without applying Darwin's own falsification criterium. Yet, even applying it and discarding neo-Darwinism still displays some captivating biological problems for further research. Also, the topic of cooperation needs additional attention.

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[72] Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.

[73] Further details at: http://www.weloennig.de/HumbleSelf_ABC.pdf http://www.weloennig.de/KutscheraWiderlegung1.html

(IV) Jerry Coyne

Now, famous evolutionary biologist **Jerry Coyne** (JC) commented in 2009 at his Website *Why Evolution is True* on the orchid *Dendrobium sinense*, which attracts the wasp/hornet *Vespa bicolor* by "an even more intricate strategy"[74]: "Rather than mimicking the wasp's mating pheromone, the flower produces a chemical that mimics the alarm pheromone of two species of honeybees that are likely to be the wasp's prey". And in 2013[75] he continued:

> "A commenter named "Asyncritus"[76] tried to leave an anti-evolution comment on a post I wrote about how some orchids in China have evolved a scent resembling the alarm pheromone of the honeybees that are the wasps' prey.
>
> The flower's scent apparently attracts the wasps looking for prey, and those wasps pollinate the orchids. This clever adaptation, a form of "olfactory mimicry" to help the flowers reproduce, was published in *Current Biology*. The orchid does *not* show morphological mimicry like some other "bee orchids, whose flowers have evolved to resemble bees, luring male bees who, in trying to copulate with the mimetic flowers, pollinate them.
>
> Here's a picture of that orchid, *Dendrobium sinese*, in the *Daily Fail* (it has not escaped my notice that perhaps the colors of the flower, which look vaguely beelike, might help attract the wasp)[77]:

> But on to the creationist. Sadly, Asyncritus, apparently knowing very little about evolution [W.-E. L.: a pejorative comment on the critic from the very beginning], tried to weigh in with this comment:
>
> > If this lot doesn't persuade any unbiassed observer that evolution is a complete nonsense, then I don't know what will.
> >
> > How can a plant possibly figure out that this compound is an alarm pheromone secreted by wasps?
> >
> > And that if it does so figure that out, how does it know that there are such things as wasps?
> >
> > And that they will come, pick up the pollen and take it to another flower to pollinate it?
> >
> > Isn't it obvious that this didn't evolve 'by small steps' and that it is perfectly designed to do the job it does so well?
> >
> > Get smart, guys.
>
> Asyncritus is the one who should get smart. Plants – or anything else – don't figure out how to evolve. (Plants, for one thing, can't figure *anything* out!)"

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[74] https://whyevolutionistrue.wordpress.com/2009/08/26/orchids-mimic-alarm-pheromones-of-bees-to-attract-wasps/ (2009) (retrievd 21 June 2018)
Original article: Brodmann J, Twele R, Francke W, Luo Yi-bo, Song Xi-qiang and Ayasse M (2009): Orchid mimics honey bee alarm pheromone in order to attract hornets for pollination. *Current Biology* **19**: 1368-1372. https://www.sciencedirect.com/science/article/pii/S0960982209014493

1,https://ac.els-cdn.com/S0960982209014493/1-s2.0-S0960982209014493-main.pdf?_tid=4cef1b46-fb34-43b7-94bf-57aa7bfd98c1&acdnat=1530088041_8e51703e12a0fa083497caa007de8e0b

[75] https://whyevolutionistrue.wordpress.com/2013/10/25/another-person-ignorant-about-evolution-tries-to-dismiss-it/

[76] This anonymus commentator probably chose his pseudonym in accord with the comment on https://en.wikipedia.org/wiki/Asyncritus_of_Hyrcania: "Asyncritus of Hyrcania, also Asynkritos (Greek: Ἀσύγκριτος, meaning "**incomparable**"), was numbered among the Seventy Disciples. He was bishop of Hyrcania in Asia.

[77] The original photo presented by Jerry Coyne was taken by H. Paulus, Ulm University.

W-E L: Of course not, “Asyncritus” – whoever that may be[78] (I don’t like these pseudonyms) – used metaphorical language here concerning the fundamental problem of how the plant “detected”, i.e. hit by one or more random mutation(s) at exactly the precise species-specific chemical compound, namely “the alarm pheromone of two species of honeybees that are likely to be the wasp’s prey”.

> JC: “If the ancestral orchid had genetic variation that made its scent resemble in some degree the bee pheromone, then it would get pollinated by wasps more often.”

W-E L: “…But if (& oh what a big if)”[79]: (1) First of all, I would like to point out that hornets of the species *Vespa bicolo*r are entirely carnivorous and – instead of pollinating flowers “more often” – normally do not pollinate any orchid species at all[80].

> “During the flowering time of *D. sinense*, there are two other sympatrically occurring orchids in bloom, *Epigeneium fargesii* and *Coelogyne fimbriata*. Hornets are not interested in the flowers of *C. fimbriata* but occasionally visit the flowers of *E. fargesii*. However, ***we never observed them to remove pollinia*** (S.X.-q., unpublished data). Therefore, the pollinia that the hornets carry are definitely from *D. sinense*.”[81]

(2) So, the ancestral orchid species (something like the original *Dendrobium sinense*?) must have had not only this genetic variation already resembling “in some degree the bee pheromone” (Z)-11-eicosen-1-ol, but also (3) must have produced it in such an amount that a ***minimal threshold value*** *was reached* to attract and almost regularly (not just occasionally) appeal and allure these otherwise meat eating hornet wasp *Vespa bicolor* to its flowers.

(4) Coyne’s statement also implies that ***some degree*** of alikeness/ comparability/semblance to (Z)-11-eicosen-1-ol *per se* would mimic the necessary volatile signal(s) to such an extent that these carnivorous hornets would time and again be attracted to exactly this orchid species’ flowers.

(5) The “chemical that mimics the alarm pheromone of two species of honeybees” must not only have been produced in the necessary ***semblance/similarity*** and ***quantity*** just mentioned but also have been concentrated at exactly the **right place** of the orchid flower: “Rather than landing and pausing on the flowers as would be typical for most pollinators, ***the hornets instead pounced on the red center of the flower***, much like their behavior when attacking prey” (Brodmann et al. p. 1368), thus the scent is ***concentrated*** inside the labellum, but not, for example, at the edges/margins of the two petals or possibly intensifying it on the undersides of them, or on the

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[78] May in fact be a creationist who believes in six literal days of creation some 6-10,000 years ago as well as the dogmata of church history of the last 1700 years. So, may I tactfully point out that I don’t accept such dogmata. However, may be quite a different person. No matter what she believes, I respect all world views including atheism/materialism as long as the believers are tolerant and nonviolant. What ever the “creationist” believes, on the orchid/hornet system he was largely right.

[79] Darwin in a different context: https://www.darwinproject.ac.uk/letter/DCP-LETT-7471.xml For the origin of life, check, please James Tour http://inference-review.com/article/an-open-letter-to-my-colleagues and https://www.youtube.com/watch?v=_zQXgJ-dXM4 and perhaps https://evolutionnews.org/2017/08/with-a-footnote-synthetic-chemist-james-tour-delivers-chastisement-to-mits-jeremy-england/

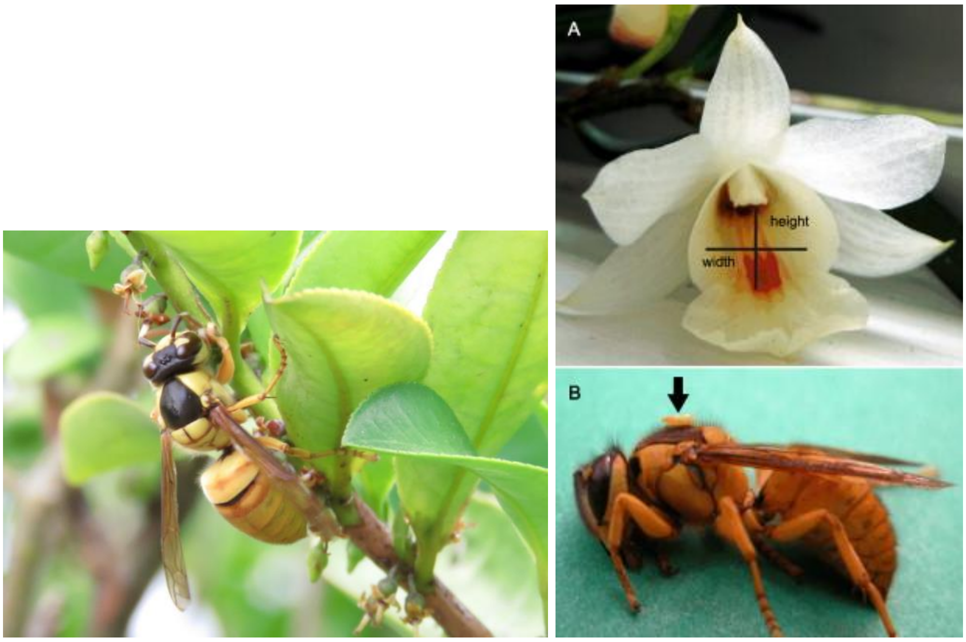
[80] See, please, photographs of Black Shield Wasp (*Vespa bicolor*) https://www.inaturalist.org/taxa/423652-Vespa-bicolor/browse_photos (retrieved 27 June 2018) As far as I could find out, any cross pollinations of plant species seem to be entirely accidental while catching prey on flowers. However, other *Vespa* species do pollinate different orchids, see, for example Agnieszka et al. (2017): https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5398293/#ref-9

[81] Brodman at al. 2009, p. 1368 https://www.sciencedirect.com/science/article/pii/S0960982209014493

lower sides of the three sepals or somewhere on the stems, leaves or roots[82]. The almost endless other possible landing places would not have been of any putative selective advantage for the plants.

(6) Brodman et al. continue to adduce evidence that *V. bicolor* is the sole pollinator of the orchid D. sinense (p. 1368):

> "***This hypothesis is supported by a comparison of the pollinator and orchid flower size* (<u>Figure 1</u>)*. The orchid flowers are assumed to have adapted morphologically to the visits of and pollination by V. bicolor.*** The mean height of the thorax of *V. bicolor* is 0.554 ± 0.022 cm standard deviation (SD) (n = 16) and the mean width is 0.538 ± 0.025 cm SD (n = 16), allowing the pollinator to fit optimally within the flower passage, which has a mean height of 0.567 ± 0.061 cm SD (n = 118) and a mean width of 0.544 ± 0.101 cm SD (n = 118). These morphological adaptations of the flowers maximize the chance that pollinia are removed by the hornets and ensure secure transfer of the pollinia to another flower. We assessed the fruit set of *D. sinense* in three different locations **and found about 13% of the flowers (n = 703) to be pollinated, as can be expected for a nectarless orchid** [8]."



Left: *V. bicolor* (photo by Kwong Chung-man[83]). Right: *D. sinense* flower (A) and *V. bicolor* forager with pollinia stuck onto the thorax (B). (Photographs by J.B. and S.X.-q.)

If JC does not assume that the key (*Vespa bicolor*) was fitting exactly into the lock (flower of *Dendrobium sinense*) from the very beginning, he again has to postulate a stepwise process by "innumerable slight variations", "infinitesimally small changes", "insensibly fine gradations"[84] etc. due to selection of correspondingly many random micro-mutations[85] to explain this suitable, this matching morphological adaptation for "the visits of and pollination by the wasp hornet".

Well, the seeds of orchids "are generally almost microscopic and very numerous, in some species over a million per capsule". Also, "all orchid species

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[82] https://www.youtube.com/watch?v=neL8JLFdM5w (retrieved 27 June 2018)

[83] Cf. again https://www.inaturalist.org/taxa/423652-Vespa-bicolor/browse_photos

[84] See Darwin and the neo-Darwinians above.

[85] Some people argue that there are no "micro-mutations", only mutations – see, however, note above.

are mycoheterotrophic during germination and reliant upon fungi to complete their lifecycles. As the chance for a seed to meet a suitable fungus is very small, only ***a minute fraction*** of all the seeds released ***grow into adult plants***"[86].

Are we to conclude that the very few adult plants (on *average* just one in a finite population), derived from the minute fraction of hundreds of thousands of seeds characterized by their small chance to meet a suitable fungus, were selected by nature because they were the fittest ones **in each step** on the way to the optimal morphological adaption of the flowers to the hornets in the almost infinite numbers of "insensible fine gradations"?

The neo-Darwinian approach by natural selection of mutations favouring adaptions is also controversial considering the following findings of population genetics (Griffith et al. 1999, p. 564; Felsenstein 2015, pp. 306-307)[87]:

> "Even a new mutation that is slightly favorable will usually be lost in the first few generations after it appears in the population, a victim of genetic drift. If a new mutation has a selective advantage of *S* in the heterozygote in which it appears, then the chance is only 2*S* that the mutation will ever succeed in taking over the population. So a mutation that is 1 percent better in fitness than the standard allele in the population ***will be lost 98 percent of the time by genetic drift***" (Griffith et al.).
>
> "When s is small, clearly 2*s* is close enough to the probability of survival to serve as a working rule of thumb. It is worth considering how small a probability of survival this is. When *s* = 0.01***, only one new mutant in 50 will succeed in spreading, despite the fact that all are advantageous***. Even with *s* as large as 0.1, large enough to guarantee fairly rapid change in gene frequencies in the deterministic case, only one new mutant in six will establish itself. Obviously, genetic drift is a powerful force when only a few copies of an allele are in existence. ***Only rarely will an allele, even if advantageous, escape from the risk of loss due to the randomness of births and deaths, and of Mendelian segregation***." [...] "So most of the loss of advantageous alleles takes place while these alleles are still present in only a few copies.... This in turn must be during the first few generations. An allele present in only one or a few copies is constantly at risk of being lost and could not last long in that state. If it survives many generations it must therefore be fortunate enough to have drifted to a larger number of copies" (Felsenstein).

Note, please, also "that the basis of these calculations are dominant mutant alleles with 1% fitness increase in the heterozygous state. In the plant kingdom, however, more than 98% of all the mutations are recessive and more than 99.99% of the dominant (as well as homozygous recessive) mutants in the plant and animal kingdoms are lowering fitness"[88].

Moreover:

> "If only a few out of [hundreds of thousands and even more than a million] individuals are to survive and reproduce, then there is some difficulty believing that it should really be the fittest who would do so. Strongly different abilities and varying environmental conditions can turn up during different phases of ontogenesis. Hiding places of predator and prey, the distances between them, local differences of biotopes and geographical circumstances, weather conditions and microclimates all belong to the repertoire of infinitely varying parameters. ***Coincidences, accidents, and chance occurrences are strongly significant in the lives of all individuals and species***. Moreover, the effects of **modifications**, which are nonheritable by definition, may be much more powerful than the effects of mutations which have only "slight or even invisible effects on the phenotype" (Mayr 1970, p. 169, similarly 1976/1997; see also Dawkins, 1995, 1998), specifying that kind of mutational effects most strongly favored for

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[86] https://en.wikipedia.org/wiki/Orchidaceae (retrieved 28 June 2018) Also good to know: "Some species, such as *Phalaenopsis*, ***Dendrobium***, and *Vanda*, produce offshoots or plantlets formed from one of the nodes along the stem, through the accumulation of growth hormones at that point. These shoots are known as keiki." "Horticultural techniques have been devised for germinating orchid seeds on an artificial nutrient medium, eliminating the requirement of the fungus for germination and greatly aiding the propagation of ornamental orchids."

[87] For the references and further discussion see http://www.weloennig.de/jfterrorchipmunks.pdf p. 3

[88] See, please, again for this and the following quotation Lönnig (2016) http://www.weloennig.de/jfterrorchipmunks.pdf

> natural selection and evolution by the neo-Darwinian school. Confronting the enormous numbers of descendants and the neverending changes of various environmental parameters, it seems to be much more probable that instead of the very rare "fittest" of the mutants or recombinants, the average [i. e. the "normal"] ones will survive and reproduce" (Lönnig 2001/2016).

Now, at the preliminary end (the present state of affairs) of this, to use an understatement, 'not so probable process', only "about 13% of the flowers (n = 703)" were detected to have been pollinated[89]. So, what would have been the percentages of each of the imperfect steps during all the way down to the present state of affairs?

(7) Even assuming that these "ifs" were all to let's say about 90% fulfilled on their way from the ancestor down to the present key-locking pollination system of orchid and hornet, in the face of only 13% of pollinated flowers in the existent condition – would that automatically imply/signify/guarantee that pollinia would be removed and transferred to other individuals in each of the latter steps of the postulated evolution of the plant species (recall, please, also the case of the occasional visits to *E. fargesii*: "…we never observed [*Vespa bicolor*] to remove pollinia")?

So, for the time being, there are already seven (so far rather speculative) big ifs. Implying – as JC and his friends evidently do – that these ifs are already fulfilled by the undeniable/incontrovertible/indisputable reality of nature… – Well, such a doubtful presupposition would constitute nothing but an exercise of faith in the almost exclusively main neo-Darwinian factors of evolution, *viz*. mutation and selection ("Faith is the substance of fossils hoped for, the evidence of links unseen"[90]).

But there are more big ifs:

> JC: "Such variants would leave more of their genes, and the adaptation would spread."

W-E L: (8) Before the seven ifs were not really fulfilled beyond their minimal threshold values in some ancestor on the way to *Dendrobium sinense*, none of the variants would have left more of their genes to successfully cheat/deceive/delude *Vespa tricolor* and hence no adaptation would spread.

> JC: "The plant doesn't need to know that there are pollinating wasps around, either. All that has to happen is that there be mutations in flower odor that attract the wasps."

W-E L: (9) "…***mutations*** in the flower odor that attract the wasps": So, here he entails several mutations in a stepwise process to explain the integrated *Dendrobium* configuration in contrast to his later verdict (see below) that "This need not have happened via a gradual, many step-process, for sometimes single mutations alone can have this effect". – However, to explain the entire system (generation, combination and coordination of the multiple components) by just a

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[89] Brodmann et. al. also: "Of the visiting insects, only hornets were observed to effect pollination, with both pollinia deposition and pollinia removal on the pronotum of the insects observed in the field (Figure 1B). Removal or deposition of pollinia by *V. bicolor* was observed in 5 of 30 visits. Furthermore, during a time period of 30 minutes, we registered 277 nest-entering or nest-leaving wasps from three colonies. Thirty of the females carried pollinia."

[90] For the history of this ironic statement, see http://www.weloennig.de/ExplosiveOrigins.pdf

single mutation appears to demand another extraordinary exercise of neo-Darwinian faith ("for natural selection can act only by taking advantage of slight successive variations; ***she can never take a leap***, but must advance by the shortest and slowest steps" – *cf*. Darwin above in agreement with most of today's neo-Darwinians favouring mutations with "slight or even invisible effects on the phenotype" – Ernst Mayr[91]).

> JC: "No evolving species has to consciously "know" what it has to do to adapt to the environment."

W-E L: Correct. To assume that any species would "consciously "know" what it has to do to adapt to the environment" would, indeed, be a very curious form of an anthropomorphism. May I doubt that "Asyncritus" made that mistake?

> JC: "This misconception—that plants and animals have to figure out how to evolve by sussing out the environment—is surprisingly common, and Asyncritus's rancor is poorly aimed. He or she is the one who needs to bone up on evolution."

W-E L: (10) "…surprisingly common?" – I have never heard such a thing except from a dwindling minority of Lamarckians (and perhaps animists). No comment on the 'poorly aimed rancor'.

> JC: "As for the step-by-step evolution of the plant "pheromone," that remains to be studied. […]

W-E L: (11) Well, how does he already know that something like a "step-by-step evolution of the plant pheromone" was necessary? Perhaps *per definitionem* nonderivable orphan genes are involved in the synthesis of the pheromone or it already belonged to the basic equipment of these plants but now – by the action of new regulator genes[92] – an entirely new species-specific expression pattern was necessary to attract the hornets. Yes, all these questions remain to be studied and cannot simply be taken for granted to prove and hence accept the neo-Darwinian view of evolution.

> JC: "We know what the compound is, for it's been extracted, structurally identified, and shown to have not only be chemically identical to the alarm pheromone of bees, but also to attract the pollinating wasps. (The compound, by the way, is (Z)-11-eicosen-1-ol.)"

W-E L: (12) This surprising fact of **chemical identity** might raise the question whether something like an ***all-none response*** is involved in the attraction of the pollinating wasps. In that case a step-by step evolution wouldn't help much (but this question also remains to be studied).

> JC: "If this compound evolved from an ancestral compound (presumably via the modification of enzymes that change the structure of organic molecules), then we should be able to find precursor compounds that have other functions in this species or its relatives, and be able to identify the pathway that synthesizes the new attractant."

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[91] See for the neo-Darwinian view also http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf p. 124 and http://www.weloennig.de/Utricularia2011Buch.pdf p. 6, footnote 9 and 234.

[92] Perhaps well-directed transposon activities are involved possibly generating specific gene duplications followed by promotor and/or enhancer transfer and also several point mutations, but at present at least even the option of perfectly new orphan genes appears to remain.

W-E L: Another “if”, which evidently again implies a series of mutational steps (all expressions in the plural form: “the modification of enzymes”, “precursor compounds” with other functions, and last not least, “the pathway”, again denoting several steps). But yes, a lot of further scientific work is necessary to answer these questions. Moreover, as already pointed out several times above, again the problem of the selective advantages and probabilities for each of these imperfect steps should be solved – imperfect in relation to the just 13% functioning present *Dendrobium sinense-Vespa-bicolor* pollination system (so, still more imperfect). So, can the neo-Darwinian answer really be taken for granted?

> JC: “This need not have happened via a gradual, many step-process, for sometimes single mutations alone can have this effect. (One “big” mutation, for instance, is known to have radically altered flower color in the species *Mimulus guttatus* versus *M. cardinalis*.)”

W-E L: Now I have to admit that I was really stunned about JC’s line of reasoning on the origin of this orchid: So far his entire argument was built around the unreserved assumption of a multistep process fully in agreement with Mayr’s (and a thousand other neo-Darwinians’) selection of mutations with “slight or even invisable effects on the phenotype” (JC: “…genetic variation that made its scent resemble in some degree the bee pheromone”, “such variants would leave more of their genes”, “mutations in flower odor that attract the wasps”, “the step-by-step evolution of the plant ‘pheromone,’ that remains to be studied”, “evolved …via the modification of enzymes that change the structure of organic molecules”, “to identify the pathway that synthesizes the new attractant”). **And now:** “***This need not have happened via a gradual, many step-process, for sometimes single mutations alone can have this effect***.” So, according to JC natural selection ***can*** take a leap, even a great one, after all!

However, in an ancestor of *Dendrobium sinense*, this one step, this single random *macro*mutation would have had to create and put together not only (a) the perfect/identical/pure alarm pheromone (Z)-11-eicosen-1-ol of the bees, but by this feat also (b) in the necessary proper amount, (c) at exactly the right place, (d) in the promptly/immediately/instantly on time generated in the red center of the flower, (e) additionally adapting it morphologically (meticulously in height and width) to the visits of and pollination by *V. bicolor*. But the atheist does not believe in miracles (*cf*. also Marcel Schützenberger: *The miracles of Darwinism*[93]).

But let us not forget that these miracles of either gradual or saltational evolution are assumed to have happened in the orchids for the ***exclusive good of themselves*** being “thieves, cheats and pirates of the plant kingdom, taking advantage of the natural systems of cooperation and ***using them for their sole benefit***” – thus potentiating the improbabilities for Darwin and the Synthetic Theory.

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[93] http://www.arn.org/docs/odesign/od172/schutz172.htm

Charles Darwin (1859): "Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each. No organ will be formed … for doing an injury to its possessor. If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous." – "Darwin…discussed at great length the evolution of fruits and flowers, **showing how traits that benefit animals first and foremost to increase plants' own reproductive success"** (Bronstein 2015, p. 12[94]). Now, ***the exact opposite is true in some 10,000 orchid species: no benefit for the animal pollinators* and selective disadvantages for both of them, the non-rewarding orchid (displaying lower pollination rates) and the pollinator (suffering fitness costs).**

A Mr. Nicolaus Covington (2013)[95] explains Darwin's falsification criterium mentioned above in relation to the *Plant Galls* quite well in modern terms as follows:

> "The logic behind this prediction of his is very simple. To use our modern genetic terms, genetic mutations that help an organism survive become common in the population precisely because you have to be alive in order to have sex and create new organisms who inherit the same genetics. ***On the other hand, a mutation that helps out a completely different species won't cause an organism to leave behind more offspring*** (unless helping out that species serves to help out the organism's survival and reproduction in some way, as when trees produce fruit for animals, but only because it allows them to leave behind more offspring)."

Nevertheless, he does not try to apply his clear realization of that falsification criterium (or others) to the orchid/wasp system (which nevertheless would not be "to the exclusive good" of the orchid) but refers to Jerry Coyne, even asserting that "all of this is pretty easy to understand with evolution", telling his readers:

> "It's rather interesting that these wasps "help" the flower, but only because the flower "tricks" them by secreting a scent that wasps respond to because the scent usually indicates the presence of honeybees, whereas here, it doesn't. All of this is pretty easy to understand with evolution, because, as Coyne puts it: "If the ancestral orchid had genetic variation that made its scent resemble in some degree the bee pheromone, then it would get pollinated by wasps more often. Such variants would leave more of their genes, and the adaptation would spread.""

See, please the detailed refutation of Coyne's contentions above.

Probably the most stunning solution of the orchid problem, but in well line with Darwin's "*we cannot believe in so gigantic an imposture*", has been offered by Doug Boucher (2016)[96] in his review of Bronstein's book:

> "Darwin himself was perhaps the first to face this problem [of mutualism] as he elucidated the implications of natural selection. He wrote in the Origin that "If it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate my theory, for such could not have been produced through natural selection" (Darwin 1859). Realizing the seriousness of this challenge, he devoted his next book to the pollination of orchids by insects[97], **showing in detail how both benefited**."

No comment.

Now, after having analyzed Coyne's text, let us return to "Asyncritus" and somewhat enhance/upgrade his statements as follows:

> *"**If this lot doesn't persuade any unbiassed observer that*** neo-Darwinian ***evolution*** by selection of random micro-mutaions (or – just as improbable – saltation by a single accidental macromutation) ***is a complete nonsense, then I don't know what will.***
>
> To use metaphorical language: ***How can a plant possibly figure out that this compound is an alarm pheromone secreted by wasps?*** In other words: Which chain/series/sequence of random micro-mutations either generated this hitherto totally absent compound (the bee alarm pheromone (Z)-11-

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[94] Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.

[95] https://www.skepticink.com/humesapprentice/2013/10/26/a-prediction-of-natural-selection/

[96] Boucher D (2016): https://academic.oup.com/icb/article/56/2/365/1749665

[97] See also Schiff (2018): "This book was meant to provide further evidence in support of his revolutionary evolutionary theory, expounded in his great work On the Origin of Species by Means of Natural Selection published 3 years earlier." https://link.springer.com/book/10.1007/978-3-319-70034-2

eicosen-1-ol) in *Dendrobium sinense* and/or by a sequence of mutations in regulatory genes expressed it optimally in the (additionally produced) red center of the flower, – the size of the flower itself evolving in a multiple step process morphologically adapting to the anatomy of *Vespa bicolor*. And what were the selective advantages for each step as long as the entire system did not function to at least to a minmal degree, above a minmal threshold value? (The basic problems for natural selection itself as decribed above not yet considered.) On the basic neo-Darwinian assumptions it is almost infinitely improbable that the plant could figure the alarm pheromone of the wasps.

To use again metaphorical language: ***And that if it does so figure that out, how does it know that there are such things as wasps***? But, of course, the plant – an unconscious being – did not figure anything out not least that there were things like wasps. Against all odds, yet according to the neo-Darwinian faith, the ancestor of *Dendrobium sinense* just stumbled/traipsed upon the fully identical pheromone of *Vespa bicolor* (in a totally unlikely) multiple step process generated by random mutations and natural selection (the "innumerable successive small microevolutionary steps") to lure the unsuspecting wasps into their non-rewarding pollination actions and behaviours, the cheated wasps probably even suffering fitness costs by the loss of time and energy.

And that they will come, pick up the pollen and take it to another flower to pollinate it? Well: "…pick up…and take it…" sounds rather active. However, in orchids they don't pick up the pollen actively, but the pollinia (i.e. entire pollen sacs, even entire anthers) are being deposited, in fact regularly even glued upon (mostly) the backside of the thorax (see Figure above) and then *inadvertently* taken to another flower to pollinate it.

Isn't it obvious that this didn't evolve 'by small steps' and that it is perfectly designed to do the job it does so well?

Get smart, guys.

(V) Florian P. Schiestl et al.

Florian Schiestl is director of the *Institut für Systematische und Evolutionäre Botanik* of the *Universität Zürich*[98]. He and his coworkers have published a series of excellent research papers on sexually deceptive orchids in almost all leading science jounals of the world – among them *Nature*, *Science*, *Proceedings of the Royal Society of London B: Biological Sciences*, *Evolution*, and many others[99].

In their otherwise excellent *Nature* paper on *Orchid pollination by sexual swindle*[100] they start to explain the evolution of these astounding phenomena as follows:

> "Common straight-chain saturated and unsaturated hydrocarbons are the key components in this chemical mimicry, which seems to be an economical means of pollinator attraction. […] Of all bee-odour samples tested, cuticle extracts elicited the most intense behavioural reactions from males, indicating that this is where the sex pheromone of *Andrena nigroaenea* is located. Extracts from the *Ophrys* flower labellum also elicited frequent copulation attempts by males (Fig. 1). […] These findings shed new light on the evolution of this fascinating insect–plant relationship."

As far as I could find out, in all their papers Schiestl and his colleagues presuppose the correctness/truth/validity of the Darwinian and neo-Darwinian view of evolution by "infinitesimally small inherited variations", "innumerable successive small microevolutionary steps" etc. (see above). However, ***they never appear to consider, examine and discuss Darwin's falsification criteria***.

Now let's have a closer look at their evolutionary hypotheses:

"Common straight-chain saturated and unsaturated hydrocarbons are the key components in this chemical mimicry…" Is chemical mimicry limited to these straight chain hydrocarbons? "These findings shed new light on the evolution of

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[98] http://www.systbot.uzh.ch/de/Personen/ProfessorenundDozenten/FlorianSchiestl.html (retrieved 4 July 2018.)

[99] See, for example, https://scholar.google.com/citations?user=J22mbxgAAAAJ&hl=de&oi=ao or check, for additional papers Google Scholar under in his name.

[100] Schiestl F P, Ayasse M, Paulus H F, Löfstedt C, Hansson B S, Ibarra F and Francke W (1999): Orchid pollination by sexual swindle. *Nature* **399**: 421-422. . *Nature* **399**: 421-422: https://tiptiktak.com/orchid-pollination-by-sexual-swindle.html

this fascinating insect–plant relationship." Sounds enticing, but will they keep their promise? We'll see. They continue:

> "Cuticular hydrocarbons, as a part of the plant surface wax, primarily prevent the loss of water. During the evolution of chemical mimicry in *O. sphegodes*, these compounds obtained the additional function of attracting pollinators, which was achieved through alterations in their relative proportions."

Reading their *Nature* article, could one perhaps not get the impression that ***common*** *cuticular hydocarbons* obtaining the additional function of attracting pollinators through alterations in their relative proportions is all there is in chemical mimicry?

However, in their paper *Pollinator attraction in a sexually deceptive orchid by means of* ***unconventional chemicals***[101] they investigated *Ophrys speculum* and found that:

> "These compounds, which are **novel in plants**, prove to be the major components of the female sex pheromone in the scoliid wasp *Campsoscolia ciliata*, and stimulate male copulatory behaviour in this pollinator species. The specificity of the signal depends primarily on the structure and enantiomeric composition of the oxygenated acids, which is the same in wasps and in the orchids. […] 9–Hydroxydecanoic acid ***is a rarely occurring compound that until now has been identified only in honeybees***. Contrary to the standard hypothesis that *Ophrys* flowers produce only 'second–class attractivity compounds' and are neglected once the pollinator females are present, we show that flowers are more attractive to the males than are their own females."

(See also the review by Ramya et al. 2018 below.) Back to their *Nature* paper: "…alterations in their relative proportions…": To generalize: Well, of all the infinite topical possibilties just in a very special inner part of the flower of an orchid and nowhere else? – Not at the undersides/undersurfaces, not in the leaves, at stems, stalks, pedicels, roots? (*Cf*. below photographs pp. 57-59, 67) Just imagine insects regularly clambering/scrambling at any other part of an orchid to "achieve pollination during an attempted copulation or precopulatory routine" say at/on the roots, stems, pedicels, or leaves where such regional alterations in the relative proportions of the hydrocarbons could also have happened – to put it perhaps a bit ironically: how advantageous for both of them, the orchid and the insect! Yet: "*Ich, hoffe nämlich, dass die Evolutionsforscher inzwischen gelernt haben, dass plausible Geschichten bestenfalls Hypothesen sind, die testbar sein sollten*"[102] – but this story is not even plausible. So, can their evolutionary hypothesis ever be tested? By natural selection of "insensibly fine gradations" and mutations with "slight or invisible effects on the phenotype"?

Also, for the expression of the specific volatiles, the ***time dimension*** has to be taken into account. In the concise words of Ramya et al. 2018, p. 63 (see reference and larger context below):

> "The orchid *Ophrys sphegodes* changes its floral volatile emission after pollination Schiestl et al. (2000, 1999). The blooming time and development stage of the flower is also very important in the analysis of volatile compounds and their emission. ***Generally, the level of emission increases from the floral bud stage to the flowering stage, and in the senescence stage, the emission levels decrease in most flowers*** (Yue et al., 2015; Zheng et al., 2015)."

So, in the cotyledon stage, for example, or most other developmental stages before the floral bud is formed – either by alterations in the relative proportions of common cuticular hydocarbons or the formation of unconventional

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[101] Ayasse M, Schiestl F P, Paulus H F, Ibarra F, Francke W (2003): http://rspb.royalsocietypublishing.org/content/270/1514/517.short

[102] A leading plant systematist in a letter to WEL(see English version below).

chemicals, their production would be, generally, not only useless but also be massively counterproductive.

The following verdict of Ramya et al. (2018, p. 63) is also true for the present case:

> "The developmental regulation of scent emission occurs at several levels, including orchestrated expression of scent biosynthetic genes (Colquhoun et al., 2010), enzyme activities (Pichersky et al., 1995; Dudareva et al., 2000; Shalit et al., 2003; Boatright et al., 2004; Nagegowda et al., 2008) and substrate availability (Dudareva et al., 2000)."

Now, was this entire spectrum of developmental regulations, including orchestrated expression of scent biosynthetic genes etc. really generated by just random micro-mutations? And was natural selection (NS) for each of the many postulated steps actually so stringent as is generally assumed by the synthetic theory? See comments on NS above and *Haldane's Dilemma* below.

"…Cuticular hydrocarbons, as a part of the plant surface wax, primarily prevent the loss of water." Yes, and there is much more to be said. Ahmad et al. (2015, p. 60)[103] summarize the main functions of surface wax as follows:

> "The term plant wax is collectively used to describe the lipid components of cuticles **covering the areal parts of plants**. Cuticular wax layer protects the plants against environmental stresses and work as a waterproof barrier. *It reduces the residual transpiration, minimize the nonstomatal water loss, shelter plants from ultraviolet radiations, decrease the water deposition on plant surface, minimize the retention of pollens, dust and air pollutants*. Plant waxes provide the protection against bacterial, fungal pathogens and reduces plant-insect interactions. Generally cuticular wax is comprised of long chain aliphatic lipids, tritrepenoids, sterols and flavonoids."

Now, let's assume an unspecific alteration in the relative proportions of the cuticular hydrocarbons affecting the entire plants – would such a macromutation really be advantageous for the plants and the insects?

Schiestl et al. continue:

> "It seems feasible that, in an ancestor of *Ophrys*, the pattern in a mutant occasionally resembled that of the sex pheromone of a pollinator species."

It seems possible that this is just another unfounded non-testable speculation. "*The pattern in a mutant…*": Of the hydrocarbon, including the expression pattern in the plant? Where does such a pattern come from? Just happened randomly/accidentally/unintentionally? "*…occasionally resembled that of the sex hormone…*"? – By chance?

These comments of Schiestl et al. remind me of a verdict of famous botanist Wilhelm Troll concerning the methods of many evolutionary biologists:

> "The words, by which of Karl Ernst von Baer used to critique the evolutionary theorists of his day are altogether still appropriate, that ***they imagine something that seems to be conceivable in order to extrapolate to its reality without any further considerations***."[104]

But "conceivable" is, of course, much more than reality allows.

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[103] Ahmad H M, Mahmood-Ur-Rahman, Ali Q, Awan S I (2015): Plant cuticular waxes: a review on functions, composition, biosyntheses mechanism and transportation. *Life Science Journal* **12**: 60-67.

[104] Troll W: "Es passen auf ihre Vertreter die Worte, die einst K. E. von Baer den Deszendenztheoretikern seiner Tage entgegengehalten hat: daß sie sich etwas ausdenken, was als möglich erscheint, um daraus ohne weiteres auf dessen Wirklichkeit zu schließen." ["Denkbar" ist jedoch sehr viel mehr, als die Realität zuläßt.] Wilhelm Troll

So, "*occasionally resembled*": Well, would that really already have been of any help for the plant, not to speak about the cheated insect pollinator? *Cf.* the discussion of Coyne's statements above, especially points (2) to (5) (key words: minimal threshold value, is some degree of similarity really sufficient? etc.)

Schiestl et al. persue:

> "This could have led to pollination by sexually excited males of this species,…"

"*…sexually excited males*"? By a compound that ***only resembled*** that of the sex pheromone of a pollinator species? And already this could have led to pollination at exactly the right place/location/region of the plant, i. e. in the flower (removing and transferring the pollinia to other plants with an equally weak/uncertain/powerless pheromone signal, which the insects could hardly identify, if at all?). Well, a more realistic possibility would be that ***this could have led to anything except pollination by males***, which, in addition, were not sexually excited at all, for hardly any threshold value would have been reached for them by just one such a step. Moreover, an entire series of such steps is postulated by modern neo-Darwinism – implying each of these countless steps had better survival chances than all the rest of the species. However, let's apply *Haldane's Dilemma* here[105]:

'This is *Haldane's dilemma* in the clear words of Theodosius Dobzhansky referring to Crow and Kimura (1977, pp. 163-164):

> "Crow and Kimura (1970) give the following example of gene substitution: "if the typical allele has a initial frequency of 10^{-4}, a population of one million individuals will have to have nine million genetic deaths each generation of it is to substitute an average of one allele per generation." [...] Granted that most species produce numbers of progeny far in excess of those needed to have the population survive, it is difficult to understand how evolution can happen at such an enormous cost in genetic deaths. Haldane saw clearly that he was confronted by a dilemma."'

See also ReMine (2007)[106] and the also thoroughgoing article on *Haldane's Dilemma* at *Creation Wiki*, last modified 2016[107].

Apart from all the scientifically doubtful points so far given above regarding text of the author's *Nature* paper: Now, what about all the cheated males getting no reward during all these millions of years? As pointed out above for Futuyma, the following point may also be applied to the evolutionary scenario given by Schiestl et al., i. e. it is 'without considering and applying selfish natural selection to the cheated insects counterbalancing the deception by correspondingly compensating positive mutations'.

> "…and natural selection would have favoured ***further plant mutants*** with a hydrocarbon pattern with an even closer resemblance."

"*…further plant mutants…closer resemblance*": My impression is that the authors simply presuppose everything they need for their evolutionary ideas:

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[105] See, please, again http://www.weloennig.de/jfterrorchipmunks.pdf especially pp. 31/32

[106] http://saintpaulscience.com/Haldane.htm (retrieved 5 July 2018)

[107] Although I'm not a creationist, some of the articles of the Creation Wiki are worth citing, as is this one: http://creationwiki.org/Haldane%27s_Dilemma

The hydrocarbon pattern, the series of nonspecified yet ever closer resembling mutants, unfailing natural selection for each step. And expression pattern of all these developmental mutations always limited to the same place/location/region of the orchid? But where are the necessary testability criteria? Is this science or are we confronted here with just speculations about an improbable non-reproducible series of mutational steps and "omnipotent"[108] natural selection? Just So Stories[109]?

Also, recall, please, the observation by Brodmann et al., especially of Song Xi-qiang, on the hornet's occasional flower visits of *Epigeneium fargesii*, that "we never observed them to remove pollinia". So, applying Kuhn's Darwin-critique[110] (more fully given below) to the paper of Schiestl et al.:

> "So, they do not even ask how the hypothetical "transitions" of such a "special mechanical contrivance", such a perfectly functioning "wholeness", as one would say today, could have survived in the alleged merciless struggle for existence. ***After all, they were not yet "ready" during this development, so they were imperfect and therefore not "functional". "Natural selection" would therefore have had an easy time to eradicate them!***"

In their *Nature* paper the authors continue to assert:

> "Apart from advantages discussed elsewhere, being pollinated by pseudocopulating males allowed the plant to decrease the costly emission of typical floral-odour compounds."

They never appear to consider the disadvantages for the pollinator insects, the pseudocopulationg males. "*…decrease the costly emission of typical floral-odour compounds*"? If this decrease were of such an important selective advantage – why, then, can all the other tens of thousands of flowering plant species, attracting insects by volatiles, afford "the costly emission of typical floral-odour compounds", yet without generating a series of mutations to circumvent and hence avoid these expensive emissions, which are *not even bypassed by many orchid species*? For the latter see Ramya et al. 2018 on *orchid floral volatiles*[111] – just to first draw attention to their abbreviations:

> "ACP: acyl–acyl carrier protein, AOS: allege oxide synthase, DMAPP: dimethyl allyl diphosphate, FPP: farnesyl pyrophosphate, FPPS: farnesyl pyrophosphate synthase, GPP: geranyl diphosphate, GGPP: geranylgeranyl diphosphate farnesyl diphosphate, IPP: isopentenyl pyrophosphate, LOX: lipoxygenase, MEP: methylerythritol 4-phosphate, MVA: mevalonic-acid, PALphenylalanine ammonia lyase." Further abbreviations: "TFs, transcription factors; VOC, volatile organic compounds."

And some introductory points (Ramya et al. 2018, p. 62):

> "To date, in flowers, ***1700 floral volatile organic compounds have been identified in 1000 seed plants*** (Knudsen and Gershenzon, 2006). In addition to flowers, the other organs that contain VOCs are involved in defense mechanisms. Floral volatiles play crucial roles in the reproductive process by attracting pollinators. Floral scents are not limited in their role in pollinator attraction and may also have other adaptive roles (Piechulla and Pott, 2003; Raguso, 2008a), for example, as repellents (Kessler et al., 2008) or providing physiological protection against abiotic stresses (Dudareva et al., 2006; Knudsen and Gershenzon, 2006).

Also, Ramya et al. report some further relevant general points on p. 63 of their excellent paper, followed by a review of floral volatiles in orchids:

> "Flowers are the largest plant organs that emit VOC compounds in plants (Knudsen and Gershenzon, 2006). ***Floral scents are restricted to specific floral parts and the developmental stages of the flower***. When flowers are ready to be pollinated, they emit

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[108] Christopher Exley (2009): Darwin, Natural selection and the biological essentiality of aluminium and silicon. Trends in Biochemical Sciences 34:589-593. (P. 589) "…both the beauty and the brilliance of natural selection are reflected in its ***omnipotence*** to explain the myriad observations of life." See also http://www.weloennig.de/PlantGalls.pdf p. 18.

[109] *Cf.* https://en.wikipedia.org/wiki/Just_So_Stories

[110] Slightly reformulated – see the original below.

[111] Ramya M, An H R, Baek Y S, Reddy K E, Park PH (2018): Orchid floral volatiles: Biosynthesis genes and transcriptional regulations. *Scientia Horticulturae* **235**: 62-69. https://www.researchgate.net/publication/323599849_Orchid_floral_volatiles_Biosynthesis_genes_and_transcriptional_regulations

> an increased amount of volatile compounds. After pollination, flowers reduce synthesis of volatiles to prevent further visitors to non-pollinated flowers (Rodriguez-Saona et al., 2011; Muhlemann et al., 2006; Negre et al., 2003). The orchid *Ophrys sphegodes* changes its floral volatile emission after pollination Schiestl et al. (2000, 1999). The blooming time and development stage of the flower is also very important in the analysis of volatile compounds and their emission. Generally, the level of emission increases from the floral bud stage to the flowering stage, and in the senescence stage, the emission levels decrease in most flowers (Yue et al., 2015; Zheng et al., 2015). ***Tissue-specific emission of floral scents is a key a characteristic of the majority of plant species.*** Among the floral parts, petals are the richest part that contains VOCs, and most flower parts, including the sepals, stamens and pistil, contain a large number of biosynthetic enzymes; ***the highest amount of gene expression is found in the flower parts*** (Rodriguez-Saona et al., 2011; Dudareva et al., 1996a; Murfitt et al., 2000; Nagegowda et al., 2008). **In some cases, floral scents are restricted to some layers**. For example, in snapdragons, floral scents are found in the upper epidermal layer and petal lobes. These results are similar to those in *C. breweri* and in roses, which have **cell-specific expression** (Dudareva et al., 1996b; Bergougnoux et al., 2007). In addition, many floral volatiles have been identified in different types of orchid flowers."[112]

For more data on flora scent compounds in orchids and other plant groups, see, please, *Google Scholar* – best use same key words "floral scent compounds".

Schiestl et al. conclude (last sentences on evolution in their paper):

> "Flowers of *O. sphegodes*, like those of many *Ophrys* species, emit only minute quantities of such volatiles. Chemical mimicry in the sexually deceptive pollination system therefore provided an economical way for the plant to ensure its transfer of gametes."

Even assuming that this economical way of emitting only minute quantities of volatiles would have provided decisive selective advantages for *O. sphegodes* and further *Ophrys* species (which selection assets one may doubt for the reasons given above) – what about mutations and natural selection during all the millions of years in the deceived, unrewarded, betrayed and sold out pollinator species, which "***may even suffer fitness costs***"? So, does Darwin's already repeatedly quoted falsification criterium not apply, then, to both, the orchid and the pollinators, and – more inclusively – to Darwinism and neo-Darwinism in general? For "we cannot believe in so gigantic an imposture" and again:

Charles Darwin (1859): "Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each. No organ will be formed … for doing an injury to its possessor. If a fair balance be struck between the good and evil caused by each part, each will be found on the whole advantageous." – "Darwin…discussed at great length the evolution of fruits and flowers, **showing how traits that benefit animals first and foremost to increase plants' own reproductive success"** (Bronstein 2015, p. 12[113]). Now, ***the exact opposite is true in some 10,000 orchid species: no benefit for the animal pollinators*** **and selective disadvantages for both of them, the non-rewarding orchid (displaying lower pollination rates) and the pollinator (suffering fitness costs).**

Now, let's turn to the topic of ***rewarding orchid species*** and the question whether they, too, constitute problems for the synthetic theory of evolution.

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[112] Ramya et al. on orchids p. 63: "In Vanda Mimi Palmer, various types of ***sesquiterpenes and floral benzenoids*** are highly expressed in the full blooming stage through ***the regulation of floral scent genes*** (Chan et al., 2011; Teh et al., 2011; Mohd-Aiman1 et al., 2015). Different types of *Maxillaria* emit strong ***vanilla or coffee-like scents***, which are responsible for pollinator attraction (Flach et al., 2004). *M. tenuifolia* Lindl., which is referred to as the 'coconut orchid' due to its consistently ***strong coconut-like scent***, was recognized as the best smelling orchid at the 18th World Orchid Conference (Perraudin et al., 2006). ***Maxillaria*** species sepal is a source of floral volatiles, and the initial flowering stage emits the greatest amount of floral volatiles and can be separated using an electronic nose and GC–MS analysis (Kim et al., 2016; Baek et al., 2016). ***Methyl jasmonate*** emission and their responsible genes CeLOX, CeAOS, CeAOC and CeJMT were ***highly regulated in sepals and petals*** compared to other floral parts of *Cymbidium ensifolium* (Huanga et al., 2015). *Phalaenopsis* is undoubtedly the most widely grown orchid in the world. Various types of ***monoterpenes*** are regulated during the full flower stage in *Phalaenopsis bellina* (Hsiao et al., 2006, 2008). In various new breeding cultivars of *Phalaenopsis*, fragrant and non-fragrant flower terpene compounds are highly expressed in fragrant orchids and the floral parts (Been et al., 2014). Some new *Phalaenopsis* breeding cultivars have ***terpenoid genes***, LIS and GDPS, that gradually increase from bud to the full flowering stage; moreover, the FNK and OC genes are highly expressed in the bud stage. ***Various floral tissues express these genes*** (Been et al., 2014). Expression of PbGDPS and its downstream putative ***monoterpene synthases***, TERPENE SYNTHASE 5 (PbTPS5) and PbTPS10, are **regulated** during flower development (Chuang et al., unpublished). PbGDPS is located in the epidermis of the petal lobe (Hsiao et al., 2008). Vanda orchid VMP three monoterpene synthase gene transcripts, ***linalool synthase*** and two ***ocimene synthases*** were expressed throughout the ***petal and sepal*** in both the adaxial and abaxial layers. qPCR analysis on different floral tissues linalool and ocimene synthases transcripts were up-regulated in the ***petal and sepal compared to the labellum and bud*** (Toh et al., 2017). VMPACA gene from Vanda Mimi Palmer highly expressed blooming stage compared bud stage and in floral parts outer and inner tepals were highly expressed compared to lip and column parts (Teh et al., 2011). The evolution of floral scent genes and the associated compound regulation in their functions has been identified in three closely related orchid species of the genus *Gymnadenia* (Gupta et al., 2014). The developmental regulation of scent emission occurs at ***several levels***, ***including orchestrated expression of scent biosynthetic genes*** (Colquhoun et al., 2010), ***enzyme activities*** (Pichersky et al., 1995; Dudareva et al., 2000; Shalit et al., 2003; Boatright et al., 2004; Nagegowda et al., 2008) ***and substrate availability*** (Dudareva et al., 2000)." – WEL: Again: Was all this developmental regulation, including orchestrated expression of scent biosynthetic genes etc. **generated by just random micro-mutations**?

[113] Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.

But what about the rewarding orchid species?

Authors like David Attenborough, Adolf Portmann, Wolfgang Kuhn, Reinhard Eichelbeck, Robert Nachtwey, Karl von Goebel and many others have raised the ensuing question:

If fertilization was fully assured and maintained in a more conservative way as practiced easily and without question utterly successfully by all the other more than 300,000[114] flowering plant species to this very day during some 100 million years of earth history[115] – why, then, ***from a purely functional point of view***, the evolution of such an awkward, laborious, tortuous, circuitous, long-winded and overelaborate pollination systems as found also in many rewarding orchid species like, for example, in *Coryanthes* and *Catasetum*? See, please, for a discussion of many details, my paper on these orchids (in German)[116].

Inflorescence of *Coryanthes speciosa* (a bucket orchid), photograph by Peter Arnold[117].

In his article of 2011 on *Coryanthes*[118], Günther Gerlach explains the fascinating details, some of which are quoted in the following paragraphs (pp. 254, 256-260; see also the photos and the comprehensive text of original paper):

> "*Coryanthes* species grow epiphytically in so-called ant-gardens (Fig. 1), which are the most complex and sophisticated of all mutualistic partnerships between ants and flowering plants."
>
> "*Coryanthes* possess trap-flowers, with a spatial separation of anther and stigma that prevents self-pollination […]
>
> Looking at the micromorphology of these trap-flowers, one can detect several adaptations to keep the pollinators from escaping by flying or crawling out of the bucket (epichile). The pollinator is prevented from flying out of the bucket because its wings are wet from the liquid dripping from the basal glands and stored in the bucket. The liquid is not pure water (nor nectar) but contains some soap-like substance (saponins?) that disrupt surface tension of the liquid.

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[114] Ollerton, J, Winfree R, Tarrant S (2011): How many flowering plants are pollinated by animals? *Oikos* **120**: 321-326. [Their estimate: **308 006 species**.]

[115] Wikipedia asserts: "The ancestors of flowering plants diverged from gymnosperms in the Triassic Period, 245 to 202 million years ago (mya), and the first flowering plants are known from 160 mya. They diversified extensively during the Lower Cretaceous, **became widespread by 120 mya**, and replaced conifers as the dominant trees from 100 to 60 mya." (Retrievd 23 June 2018)

[116] Lönnig W-E (2003): *Coryanthes* und *Catasetum*: BIETET DIE SYNTHETISCHE EVOLUTIONSTHEORIE EINE WISSENSCHAFTLICH GESICHERTE ERKLÄRUNG´FÜR DEN URSPRUNG DER SYNORGANISIERTEN STRUKTUREN DIESER (und anderer) ORCHIDEEN? http://www.weloennig.de/CorCat.html

[117] Arnold P (1994): Orchideen. Fotografien und Texte von Peter Arnold. Collection Rolf Heyne. Wilhelm Heyne Verlag München. For 471 (four hundred seventy-one!) additional photographs of different species of this genus, see http://www.orchidsrepbiol.de/cgi-bin/img_db/img_display.pl (As for the photograph of the *Coryanthes* inflorescence presented above, see also Lönnig 2003.

[118] Gerlach G (2011): The genus *Coryanthes*: A paradigm in ecology. See full paper here: http://www.lankesteriana.org/lankesteriana/LANKESTERIANA%2011(3)%20/11_Lankesteriana%2011(3)%20Gerlach.pdf (retrieved 24 June 2018)

> The walls of the bucket formed by the lip show cell arrangements similar to the carnivorous pitcher plants Cephalotus follicularis Labill. (Cephalotaceae) and Darlingtonia californica Torr. (Sarraceniaceae), which are not related to orchids (Barthlott and Ehler, 1977). The cells overlap a bit like roof tiles, and their surfaces are covered by epicuticular waxes (Plate 2). These waxy, shingle-like surfaces are slippery, preventing the bees from climbing out of the bucket. The column also forms part of the trap; the cells lie side by side and also are covered by waxes.
>
> Like all other Stanhopeinae, flowers of *Coryanthes* are pollinated by male, perfume-collecting euglossine bees. The floral fragrance is produced by **osmophores hidden under the mostly cup-shaped hypochile of the lip**. **These volatile substances are both the attractant and reward for the bees**. Each bee species has species-specific fragrance preferences that may also vary geographically and seasonally. In addition to orchid flowers, male euglossines collect volatiles from rotten wood or feces.
>
> After collecting the fragrance compounds at the horn-shaped osmophore below the hood (hypochile) of the lip using its feathery, foretarsal brushes, the male euglossine bee hovers and transfers the accumulated chemicals to its hollow, inflated hind tibiae. Flying around with other individuals, eventually competing with them, the pollinator comes into contact with drops on the pleuridia (liquid-secreting glands at the base of the column) and falls in the liquid-filled bucket (epichile). From here the bee cannot escape because of the smooth surface of the inner side and its now-moistened wings. A lip callus at the level of the liquid provides a foothold and directs the bee towards the exit passageway formed by the tip of the lip and the column apex. The claw of the lip is flexible, enabling the bee to push the lip a little bit apart from the column, widening the exit so he can exit the bath. As he exits, he first passes the stigma. If he bears a pollinarium from a former visit, the bee presses the pollinia into the transverse stigmatic slit by its forward movement. The rostellum serves as a fork, catching the stipes and freeing the pollinia from the stipe and viscidium. As the bee struggles farther out the exit channel, the pollinarium is glued to the rear of his thorax. The pollinator struggles to get out of the flower, made more difficult by the slippery surfaces and lack of any structures that he can grasp with feet or mandibles (Plate 4). After successfully exiting the passage formed by lip and column, the bee remains on the flower for some time to dry itself. The entire pollination process lasts from 10 to 30 minutes depending on the presence or absence of the pollinarium.
>
> Self-pollination is prevented by two mechanisms. First, the bee is probably traumatized by the bath and pollinarium placement and is less likely to revisit that same flower. Second, the fresh pollinia are too large to fit in the stigmatic slit and must dry for several minutes before they have shrunk enough to fit into the stigma.
>
> The high degree of pollinator specificity mediated by floral fragrance composition may have several roles. First, it provides a reproductive isolating mechanism among sympatric species. Second, it reduces the number of bees of the wrong size from visiting the flower. […]
>
> The floral fragrance of *Coryanthes kaiseriana* G. Gerlach (among other species) collected by the headspace technique includes two interesting chemical compounds (Fig. 3). 2 (methylamino)benzaldehyde (5) is **a rare natural product**, characterized by a peculiar dusty, leathery but still sweetish odor that is typical for *C. mastersiana* Lehm. (Gerlach & Schill, 1989; Kaiser, 2006). […] In all clones investigated the fragrance is highly dominated by 2-(methylamino)benzaldehyde showing concentrations from 80-99%. […] E,Z)-1,3,5-Undeca-1,3,5-triene (4) is a highly fragrant representative of the other interesting group of chemicals in the fragrance of this *Coryanthes* species."

Sir David Attenborough remarks after reference to the native Madagascar orchid *Angraecum sesquipedale*[119] and the pollinating moths in a similar manner (1995, pp. 104/106):

> "Other orchids are also known to have developed very complicated and elaborate pollination systems, and in some cases***, one has to ask why so much energy has been invested to achieve a result that most plants accomplish with much less effort***. This applies, for example, to the helmet flower [Coryanthes], which grows in the treetops of the jungle trees of Central America."[120]

One oft the more prominant European botanists, Karl von Goebel[121], added on the flowers of orchids that:

> "…all the wonderful adaptations of orchid flowers are no more effective than countless much simpler devices. We find the intricate facilities of many orchid flowers, e. g. *Catasetum* with its technique for the ejection of the pollinia, *Coryanthes* with its lip bath for the flower visitors, as a work of art wonderful. But from a flat usefulness point of view, all this is "luxury adaptation", which is understandable to us if, for the forms they exhibit, it was one that was determined and given throughout their entire organization. Then it is not a [superflouos] luxury but a purposeful one for an orchid (i.e. taking into account only what has been achieved). Selection theory rejects such a design, which takes place through internal causes in a definite direction, but it is neither sufficient to explain the "origin of the species" nor to convey to us an understanding of the diversity of adaptations: just because

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[119]We are going to come back to this example below.

[120] At present this a back translation from the German edition oft the book. I'm going to try to get to the original text, which I expect will be very similar to the quotation just given.

German text: "Auch andere Orchideen sind dafür bekannt, sehr komplizierte und aufwändige Bestäubungssysteme entwickelt zu haben, wobei man sich in einigen Fällen fragen muß warum soviel Energie investiert wurde, um ein Resultat zu erzielen, das die meisten Pflanzen mit sehr viel weniger Aufwand erreichen. Das gilt etwa für die Helmblume [*Coryanthes*], die in den Wipfeln der Urwaldbäume Mittelamerikas wächst."
Attenborough D. (1995): Das geheime Leben der Pflanzen. Bertelsmann Verlag. Gütersloh.

[121] https://en.wikipedia.org/wiki/Karl_Ritter_von_Goebel

> it removes the “logos” from morphology and wants to dissolve them into a mixture of directionless variations" (spaced by von Goebel).[122]

Wilhelm Troll[123], the greatest plant morphologist of the 20th century, agrees with von Goebel’s inferences as follows:

> “…from a flat usefulness point of view, facilities such as a *Catasetum* flower with its device of pollinia ejection or a *Coryanthes* flower with its lip bath, are luxury adaptations for the flower visitors, which achieve nothing more than the much simpler pollination facilities of numerous other orchids and therefore cannot have been bred in the struggle for life.”[124]

Professor Wolfgang Kuhn (University Saarbrücken)[125] has this to say on Darwin and the origin of *Coryanthes*:

> “After all, old Darwin concedes, following this prime example [of *Coryanthes*] against blind chance as a “creative cause”, “in many cases it is most difficult even to conjecture by what transitions organs have arrived at their present state”. Unfortunately, like his successors, he does not think problems through to their logical conclusion. ***So, he does not even ask how the hypothetical “transitions” of such a “special mechanical contrivance”, such a perfectly functioning “wholeness”, as one would say today, could have survived in the alleged merciless struggle for existence. After all, they were not yet “ready” during this development, so they were imperfect and therefore not “functional”. “Natural selection” would therefore have had an easy time to eradicate them!*** It would certainly be a delightful but hardly solvable task for a probability mathematician, in spite of all the modern computer facilities he could feed with the relevant data, to give the probability or, more accurately, the undoubtedly not even in astronomical terms expressable unlikelihood/improbability, to attain proper functioning, calculating all the “random” coincidences necessary for – "on both sides" – the flower as well as their visitors, the bumblebees!"[126]

Moreover, Kuhn has dealt with the selection question concerning the orchids as also as follows[127]:

> "Surprisingly, however, it does not seem to amaze anyone that there are undeniably more daisies and dandelion plants, and there are far more simpler ‘buttercups’ on our meadows than orchids. All of them, therefore, were able to exist and survive in the "struggle for existence" – even better and much, much more successful than the few orchids that occur often rather concealed here and there in the midst of them. Since the number of offspring [of ‘buttercups’ and many other plant species] is so much greater than of those vulnerable rarities in need of protection, they have turned out to be, according to Darwin, by far the "fittest" in the "struggle for survival." So why was it *necessary* for the orchids to have evolved, when this evolutionary process greatly reduced their chances of survival, rather than increasing them? Of course, it would also be easier to say: Why in the world so complicated, when the same thing works faster, more successfully and so infinitely much simpler?[128]

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[122] Original German text: "daß alle die wunderbaren Anpassungen der Orchideenblüten nicht mehr erreichen, als zahllose viel einfachere Bestäubungseinrichtungen. Wir finden die verwickelten Einrichtungen vieler Orchideenblüten, z.B. Catasetum mit seiner Pollinienabschleuderung, Coryanthes mit ihrem Lippenbad für die Blütenbesucher, als Kunstwerk wundervoll. Aber vom platten Nützlichkeitsstandpunkt aus ist das alles eine "Luxusanpassung", die uns dann verständlich ist, wenn sie für die Formen, welche sie aufweisen, eine durch ihre ganze Organisation bestimmte und gegebene war. Dann ist sie [die 'Anpassung'] kein Luxus, sondern eine zwar nicht an sich (d.h. wenn man nur auf das Rücksicht nimmt, was erreicht wird), aber für eine Orchidee zweckmäßige. Die Selektionstheorie weist eine solche durch innere Ursachen in bestimmter Richtung erfolgende Gestaltung ab. Aber sie ist weder zureichend, die "Entstehung der Arten" noch die Vielfältigkeit der Anpassungen uns verständlich zu machen: eben weil sie der Morphologie den "logos" nimmt und sie in ein Gemenge an sich richtungslose[r] Variationen auflösen will" (spaced by von Goebel).

[123] https://de.wikipedia.org/wiki/Wilhelm_Troll see also: https://academic.oup.com/aob/article/88/6/1153/2587320

[124] Original German: "... vom platten Nützlichkeitsstandpunkt aus seien Einrichtungen wie die einer *Catasetum*-Blüte mit ihrer Pollinienabschleuderung oder einer Coryanthes-Blüte mit ihrem Lippenbad für die Blütenbesucher Luxusanpassungen, die nicht mehr erreichen als die viel einfacheren Bestäubungseinrichtungen zahlreicher anderer Orchideen und deshalb im Kampf ums Dasein nicht gezüchtet sein können..."

[125] https://de.wikipedia.org/wiki/Wolfgang_Kuhn_(Biologe) (retrieved 2 July 2018)

[126] “Immerhin räumt der alte Darwin im Anschluß an dieses Paradebeispiel gegen den blinden Zufall als "schöpferische Ursache" ein, es sei "in vielen Fällen äußerst schwierig...auch nur zu mutmaßen, durch welche Übergänge Organe ihren jetzigen Zustand erreicht haben". Nur denkt er leider, wie seine Nachfolger noch immer, nicht konsequent bis zu Ende. So stellt sich ihm erst gar nicht die Frage, wie denn die hypothetischen "Vorstufen" eines derartigen "Präzisionsmechanismus", einer solch fehlerfrei funktionierenden "Ganzheit", wie man heute sagen würde, im angeblich erbarmungslosen Kampf ums Dasein hätten überleben können. Immerhin waren sie ja während dieser Entwicklung noch nicht "fertig", mithin also unvollkommen und damit nicht "funktionsfähig". Die "natürliche Auslese" hätte demnach leichtes Spiel damit gehabt, sie auszumerzen! Es wäre für einen Wahrscheinlichkeitsmathematiker sicher eine reizvolle, wenn auch trotz aller modernen Computer, die er mit den entsprechenden Daten füttern könnte, kaum lösbare Aufgabe, die Wahrscheinlichkeit oder, treffender gesagt, die zweifellos nicht einmal mehr in astronomischen Zahlen auszudrückende Unwahrscheinlichkeit eines "zufälligen" Zusammentreffens aller zum richtigen Funktionieren nun einmal erforderlichen Voraussetzungen auszurechnen - und zwar "auf beiden Seiten": bei der Blüte sowohl als auch bei ihren Besuchern, den Hummeln!“

[127] Kuhn W (1985): Stolpersteine des Darwinismus (Band 2), pp. 177-182. Factum-Taschenbuch Nr. 105 Berneck/Schweiz.

[128] Original German text: “Überraschenderweise jedoch scheint es gerade niemanden zu überraschen, daß es unleugbar mehr Gänseblümchen und Löwenzahnpflanzen, ja noch weit mehr viel einfacher gebaute "Butterblumen" auf unseren Wiesen gibt als Orchideen. Sie alle vermochten demnach im "Kampf ums Dasein" zu bestehen und zu überleben - sogar besser und sehr, sehr viel erfolgreicher als die paar Orchideen, die hier und da versteckt mitten unter ihnen blühen mögen. Da ihre Nachkommenzahl also außerordentlich viel größer ist als bei diesen ausgesprochenen, schutzbedürftigen Seltenheiten, erwiesen sie sich nach Darwin als die bei weitem "Tüchtigeren", die "Fittesten" im "Kampf ums Überleben". Weshalb also hätten sich jemals Orchideen entwickeln müssen, wo

However, the synthetic theory of evolution does not claim that the orchids *necessarily* had to evolve, but were rather generated unintentionally by the rules of the evolutionary game of random micro-mutations and natural selection.

Nevertheless, one wonders, of course, how the orchids could arise in contradiction to these rules.

Kuhn continues:

> "An ordinary "buttercup" [*Ranunculus*] […] grows not only at the edge of a road or meadow, but is everywhere at home, on the forest meadow as well as on poor sandy soil, on dry limestone slopes or even in damp, nutrient-poor high moorland , while the insect orchids rely solely on limestone soils with very specific PH levels. The buttercups neither need to produce sophisticated fragrances, nor any insect-mimic dummies to be pollinated. Simple yellow pigment is enough to catch the insects from the green background of the other meadow plants, and to give them sufficient pollen and they can absolutely do it without "pollinia", without "rain protection", and adhesive mechanisms! Not even nectar guides as "signposts" for the flower visitors are required. Tiny amounts of nectar at the bottom of the yellow nectar leaves (which look like petals) under sheltering scales, reward the pollinating insects for their effort. But even that [seems to be] completely superfluous "luxury", because some buttercups lack even these nectar glands – and they do not die out in the "struggle for existence"!
>
> Basically, evolution (which, curiously enough, some neo-Darwinians personify!) could have left it at the simplest and most successful flower shape, such as [the] star-shaped, "radial-symmetrical" flowers, like the buttercup plants, especially conspicuous such as the common lesser celandine [*Ranunculus ficaria*] or the wood anemone [*Anemone nemorosa*] appearing at the same time with it in the spring. It would have been absolutely not "necessary" to form other flower forms, as they have, for example, the Labiates [Labiatae]**,** the figwort family [Scophulariaceae], bellflowers [Campanulaceae], etc. Once again, the number of offspring as the yardstick, they have by no means proved to be the "most efficient" by these inevitable "improvements" of flower construction!"[129]

Reinhard Eichelbeck has this to say on the selection question regarding the topic of mimicry so relevant for our orchids (1999, pp. 195/196)[130]:

> "If mimicking or mimicry does have such a survival advantage, why, then, is not it more common? This question is called in America, the "refrigerator error," said Professor Wolfgang Wickler, author of a standard work on mimicry, in an article in the journal "Natur" (Nature?): "Because, of course, the same argument can be applied to refrigerators. Refrigerators can not offer so much an advantage as one commonly assumes, because most people in the world can do without a refrigerator." Following the logic of this argument, one could say: The refrigerator is indeed convenient, but not an unconditional "survival advantage", because in the past man has managed to survive for more than 50,000 years without refrigerators. And if the same applies to mimicking and mimicry as to the fridge, then they are not necessarily "survival advantages", but they are simply just comfortable. But how can that be when, according to Darwin, everything that is produced by "natural selection" must represent a "survival advantage" in the "struggle for existence"?"[131]

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doch gerade dieser evolutive Prozeß ihre Überlebenschancen stark verringerte, statt sie im Gegenteil zu erhöhen? Man könnte es freilich auch einfacher formulieren: Warum denn in aller Welt so kompliziert, wenn doch just das gleiche rascher, erfolgreicher und so unendlich viel einfacher funktioniert?"

[128] Second quotation: "Eine ganz gewöhnliche "Butterblume" - welche unserer vielen Hahnenfußarten der Volksmund auch immer so bezeichnen mag - ist nicht nur am Wegrand oder Wiesenrain, auf der Waldwiese ebenso wie auf dürftigem Sandboden, auf trockenen Kalkhängen oder sogar im feuchten, nährstoffarmen Hochmoorboden überall "zuhause", während die Insekten-Orchideen ausschließlich auf Kalkböden mit ganz bestimmten PH-Werten angewiesen sind. Sie brauchen darüberhinaus auch weder raffinierte Düfte zu erzeugen, noch irgendwelche Insekten nachahmende Attrappenformen auszubilden, um dennoch bestäubt zu werden. Ihnen genügt einfaches gelbes Pigment durchaus, um den Insekten vor dem grünen Hintergrund der anderen Wiesenpflanzen aufzufallen, und sie können, um ihnen ausreichend Pollen mitzugeben, auf "Pollinien" mit "Regenschutz" und Haftmechanismen absolut verzichten! Nicht einmal irgendwelche Saftmale als "Wegweiser" für die Blütenbesucher sind erforderlich. Winzige Mengen Nektar am Grunde der gelben Nektarblätter (die wie Blütenkronblätter aussehen) unter bergenden Schuppen abgesondert, belohnen die bestäubenden Insekten für ihre Mühe. Aber sogar das ist völlig überflüssiger "Luxus", denn bei einigen Hahnenfußarten fehlen selbst diese Nektardrüsen - und auch sie sterben keineswegs etwa aus im "Kampf ums Dasein"!

Im Grunde genommen hätte es die Evolution (von der seltsamerweise manche Neodarwinisten wie von einer Person reden!) also ruhig bei der einfachsten und zugleich erfolgreichsten Blütenform belassen können, etwa bei sternförmigen, "radiärsymmetrischen" Blüten, wie sie heute noch die Hahnenfußgewächse, besonders auffällig etwa das häufige Scharbockskraut oder das im Frühjahr gleichzeitig mit ihm erscheinende Buschwindröschen besitzt. Es wäre absolut nicht "nötig" gewesen, andere Blütenformen auszubilden, wie sie beispielsweise die Lippenblütler, Rachenblütler, Glockenblumen usw. besitzen. Wiederum die Zahl der Nachkommen als Maßstab angelegt, haben sie sich keineswegs durch diese unvermeintlichen "Verbesserungen" im Blütenbau als die "Tüchtigsten" erwiesen!"

[130] Eichelbeck R (1999, pp. 195/196): Das Darwin-Komplott. Riemann Verlag/C. Bertelsmann Verlag GmbH; Güterloh.

[131] Original German text: "Wenn Mimese oder Mimikry tatsächlich einen derartigen Überlebensvorteil haben, warum gibt es sie dann nicht öfter? Diese Fragestellung nenne man in Amerika den "Kühlschrankirrtum", meinte Professor Wolfgang Wickler, Verfasser eines Standardwerkes über Mimikry, in einem Artikel der Zeitschrift "Natur": "Denn natürlich kann dasselbe Argument auf Kühlschränke angewendet werden. Kühlschränke können keinen so großen Vorteil bieten, wie man gemeinhin annimmt, denn die meisten Menschen auf der Welt kommen ohne Kühlschrank aus." Der Logik dieses Argumentes folgend, könnte man sagen: Der Kühlschrank ist in der Tat zwar bequem, aber kein unbedingter "Überlebensvorteil", denn der Mensch hat es schließlich in der Vergangenheit geschafft, mehr als 50 000 Jahre ohne Kühlschränke zu überleben. Und wenn für Mimese und Mimikry das gleiche gilt wie für den Kühlschrank, dann sind sie

In any case, this explanation would be as far removed as possible from Darwin's natural selection justification for the origin of species and of today's synthetic evolutionary theory, not to mention the fact that the range of new synorganisations seems to be extremely “uncomfortable”.

Let's go back to our orchids, where these objections can be clearly illustrated. Robert Nachtwey notes in his excellent work *INSTINKT RÄTSEL DER WELT* on the structure and function of orchid flowers (1950, pp. 133/144): [132]

> “These flowers are the expression of a perfectly finished [in sich vollendeten: closed functional/absolutely self-contained] technical plan. Every detail appears as a necessary part of the whole. If the nectar were to accumulate freely in the spur, as is customary in innumerable spurred flowers, as in buttercup plants [Ranunculaceae] and members of the figwort family [Scrophulariaceae], there would be no unconditional guarantee that the insect would press its head firmly into the flower; therefore, the nectar is stored in the tissue of the spur wall. However, the stigma lies just below the beak, so that the pollinia must necessarily hit the surface of the stigma as soon as they bend slightly forward. And that they really bend themselves, that they actually do this inclination, again results from other details of the construction. Namely, the stalks of the pollinia consist of a watery gelatinous mass, which quickly loses its moisture and its tension under ordinary atmospheric conditions, so that the stalks on the insect's head sink downwards in half a minute. Therefore, at the place of their formation they must be kept moist, and that’s why they rest well packed in bags, which protect them excellenty against drying up. Of course, these protective pouches must again be exceedingly tender, so that they can instantly rip open lengthwise if the insect pulls the pollinia along with it.
>
> The sticky disks on the pollinia stalks carry a liquid glue which hardens instantaneously in the air and then adheres extremely firmly to the insect's head. The two pollen lumps are again extremely functionally prepared. They consist of many individual pollen packets, which are interconnected by delicate, sticky threads. If they are now pressed onto the stigma surface of a flower, only a few pollen bags stick to the stigma, because the connecting threads tear. The other packages, however, remain on the insect head, are taken along and carried on other flowers. In this way, an immense number of pollen grains from numerous flowers always come on a single stima, and thus multiple, mutual cross-pollination is guaranteed. The very numerous seeds of a style then develop into very many different individual plants.
>
> How many meaningful inventions in a single *Orchis* flower, every smallest detail has its special meaning in the plan of the whole and none should be missing. If the glue on the adhesive pads did not harden immediately, everything else would be meaningless, because the pollinia were lost. If the stalks of the pollinia did not immediately bend down, the pollen grains would not reach the stigma of the new flower, and again the whole apparatus would have been built completely in vain.
>
> But if anyone says that one could explain the origin of all these meaningful details of the orchid flower with the random theory of Darwin, then the power of his faith must be able to move mountains, for such a coincidental encounter [or happenstance] would be the greatest miracle conceivable. The construction [or generation] of the *Orchis* flower is just as unnecessary in the struggle for life as the kettle-trap of the aroids [Araceae] because thousands of other plant species, which do not possess such apparatus, preserve their kind and multiply massively.”

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also auch nicht unbedingte "Überlebensvorteile", sondern sie sind eben einfach nur bequem. Wie kann das aber sein, wo doch nach Darwin alles, was von der "natürlichen Selektion" erzeugt wird, einen "Überlebensvorteil" im "Kampf ums Dasein" darstellen muß?“

[132] Nachtwey R (1950) Instinkt – Rätsel der Welt. Morus Verlag, Berlin. “Diese Blumen sind der Ausdruck eines in sich vollendeten technischen Planes. Jede Einzelheit erscheint als notwendiges Glied des Ganzen. Würde sich der Nektar frei im Sporn ansammeln, wie es doch bei unzähligen gespornten Blüten, bei Hahnenfußgewächsen und Rachenblütlern üblich ist, so wäre nicht die unbedingte Gewähr dafür gegeben, daß das Insekt sein Köpfchen fest in die Blüte preßt; deshalb bleibt der Nektar im Gewebe der Spornwandung aufbewahrt. Die Narbe liegt aber dicht unterhalb des Schnäbelchens, so daß die Pollinien notwendig auf die Narbenfläche treffen müssen, sobald sie sich nur etwas nach vorn senken. Und daß sie sich wirklich senken, daß sie tatsächlich diese Neigung ausführen, ergibt sich wieder aus anderen Einzelheiten der Konstruktion. Die Pollinienstielchen bestehen nämlich aus einer wasserhaltigen Gallertmasse, die unter gewöhnlichen atmosphärischen Bedingungen schnell ihre Feuchtigkeit und ihre Spannung verliert, so daß die Stielchen am Insektenkopf schon in einer halben Minute nach unten sinken. Am Ort ihrer Entstehung müssen sie also feucht aufbewahrt werden, sie ruhen deshalb wohlverpackt in Säckchen, die sie vorzüglich gegen das Vertrocknen schützen. Natürlich müssen diese Schutzbeutelchen wiederum ganz außerordentlich zart sein, damit sie sofort der Länge nach aufreißen, wenn das Insekt die Pollinien mit sich zieht.

Die Klebscheibchen an den Pollinienstielchen tragen einen flüssigen Leim, der an der Luft augenblicklich erhärtet und dann außerordentlich fest am Insektenkopf haftet. Auch die beiden Pollenklümpchen sind wieder äußerst zweckmäßig eingerichtet. Sie bestehen aus vielen einzelnen Blütenstaubpäckchen, die untereinander durch zarte, klebrige Fäden verbunden sind. Werden sie nun auf die Narbenfläche einer Blüte gedrückt, so bleiben nur einige Pollenpäckchen auf der Narbe haften, da die Verbindungsfädchen zerreißen. Die andern Päckchen aber bleiben am Insektenkopf, werden weiter mitgenommen und auf andere Blüten getragen. Auf diese Weise kommen stets ungemein viele Pollenkörner aus den verschiedensten Blüten auf eine einzige Narbe, und somit ist vielfache, wechselseitige Fremdbestäubung gewährleistet. Die sehr zahlreichen Samen eines Fruchtknotens entwickeln dann ganz verschiedene Individuen.

Wieviel sinnvolle Erfindung in einer einzigen Orchisblüte, jede kleinste Einzelheit hat ihre besondere Bedeutung im Plan des Ganzen und keine dürfte fehlen. Würde der Leim am Klebescheibchen nicht sofort hart werden, so wäre alles andere sinnlos, weil die Pollinien verloren gingen. Neigte sich das Pollinienstielchen nicht alsbald nach unten, so kämen die Blütenstaubkörner nicht auf die Narbe der neuen Blüte, und wieder wäre der ganze Apparat vollständig umsonst gebaut.

Wenn aber jemand meint, man könnte die Entstehung all dieser sinnvollen Einzelheiten der Orchisblüte mit der Zufallstheorie Darwins erklären, so muß die Kraft seines Glaubens Berge versetzen können, denn ein solches zufälliges Zusammentreffen wäre das größte Wunder. Die Errichtung der Orchisblüte ist im Daseinskampf ebensowenig notwendig wie die Kesselfalle des Aronstabs, denn Tausende anderer Pflanzen, die solche Apparate nicht besitzen, erhalten ihre Art und vermehren sich massenhaft.

Now let's have a very short look at some of the integrated ingenious systems of the Bauplan of *Catasetum* according to a what seems to be a knowledgeable Wikipedia author (last edited 16 June 2018; retrieved 2 July 2018)[133]:

> "The inflorescence is borne on the basis. It consists of very fleshy flowers that are unisexual, which is exceptional for orchids. The colorful male and yellowish-green female flowers are typically situated on different plants. Which type of flower a plant produces is determined by the conditions under which it grows. Male and female flowers are markedly different in size and color. At first, taxonomists even thought they were dealing with different species, a puzzle which Charles Darwin resolved when writing Fertilisation of Orchids.[2][3] There are rare cases in which a single plant in intermediate conditions will produce both male and female flowers.
>
> The male flowers have a remarkable technique for the ejection of the pollinia. Sack-Shaped Catasetum (Catasetum saccatum), a tropical South American species, discussed by Darwin, actually launches its viscid pollen sacs with explosive force, when an insect touches a seta. He was ridiculed for reporting this by the naturalist Thomas Huxley.[4]

The hype about the Madagascar Star Orchid and the Hawk Moth

Darwin's and the neo-Darwinian's falsification criterium, as examined and discussed in detail above, as well as the immense evolutionary problems for the origin of orchid species like *Coryanthes* and *Catasetum* (not only by an infinite number of random micro-mutations and "omnipotent" natural selection but also by all the other hypothetical evolutionary factors discussed today), have almost totally been ignored and/or forgotten in the common awareness of the scientific world as well as the public expecting to get answers from it.

So, instead of an honest examination of the origin of such widespread but dangerous facts of life doubting the accepted truth of the materialistic world view, there appears to be an endless hype about the "predictive power" of Darwin's theory of natural selection (and evolution in general) in the case of *Angraecum sesquipedale*, the Madacascar Star Orchid.

This is what Darwin had to say about this species (1862, pp. 197-203[134], very similar in the 2nd edition 1882, pp. 162-166; cf. full text in the links below)[135]:

> "I fear that the reader will be wearied, but I must say a few words on the *Angræcum sesquipedale*, of which the large six-rayed flowers, like stars formed of snow-white wax, have excited the admiration of travellers in Madagascar. A ***whip-like green nectary of astonishing length hangs down beneath the labellum***. In several flowers sent me by Mr. Bateman I found the nectaries eleven and a half inches long, with only the lowerinch and a half filled with very sweet nectar.
>
> What can be the use, it may be asked, of a nectary of such disproportional length? We shall, I think, see that the fertilisation of the plant depends on this length and on nectar being contained only within the lower and attenuated extremity. It is, however, surprising that any insect should be able to reach the nectar: our English sphinxes have probosces as long as their bodies: ***but in Madagascar there must be moths with probosces capable of extension to a length of between ten and eleven inches***!
>
> […] If the *Angræcum* in its native forests secretes more nectar than did the vigorous plants sent me by Mr. Bateman, so that the nectary becomes filled, small moths might obtain their share, but they would not benefit the plant. The pollinia would not be withdrawn until some huge moth, with a wonderfully long proboscis, tried to drain the last drop. […] On the other hand, as the nectar, at least in the lower

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[133] https://en.wikipedia.org/wiki/Catasetum
For many more details, see please again http://www.weloennig.de/CorCat.html

[134] http://darwin-online.org.uk/content/frameset?itemID=F800&viewtype=text&pageseq=1

[135] http://darwin-online.org.uk/content/frameset?itemID=F803&viewtype=text&pageseq=1

> part of the nectary, is stored safe from depredation by other insects, the extinction of the *Angræcum* would probably be a serious loss to these moths. We can thus ***partially understand*** how the astonishing length of the nectary ***may have been*** acquired by successive modifications. As certain moths of Madagascar became larger through natural selection in relation to their general conditions of life, either in the larval or mature state, ***or as the proboscis alone was lengthened*** to obtain honey from the *Angræcum* and other deep tubular flowers, those individual plants of the *Angræcum* which had the longest nectaries (and the nectary varies much in length in some Orchids), and which, consequently, compelled the moths to insert their probosces up to the very base, would be fertilised. These plants would yield most seed, and the seedlings would generally inherit longer nectaries; and so it would be in successive generations of the plant and moth. ***Thus, it would appear that there has been a race in gaining length between the nectary of the Angræcum and the proboscis of certain moths***; but the ***Angræcum* has triumphed**, for it flourishes and abounds in the forests of Madagascar, and still troubles each moth to insert its proboscis as far as possible in order to drain the last drop of nectar.”

“The story of its postulated pollinator has come to be seen as one of the celebrated predictions of the theory of evolution.”[136]

Similarly Michael McCarthy in the *INDEPENDENT* (2014)[137], *see also ENCYCLOPAEDIA BRITANNICA* (2018) on Hawk moth and *Angraecum sesquipedale*[138]. Or in the words of palaeontologist Dave Horne (2 Oct 2013)[139] for the general public in *THE GUARDIAN* on “*Moth tongues, orchids and Darwin – the predictive power of evolution*”:

> “The theory of evolution has some ***wonderful predictive powers*** and because attempting to verify or falsify hypotheses is a core part of any science, setting up ideas for testing is fundamental to research. Some of these hypotheses are rather harder to work on than others, especially in the case of direct observations of an unusual event being required to provide confirmation. In the case of Darwin's moth, it has taken a whole series of studies over a huge period of time to provide ***conclusive evidence of one of the great ecological and evolutionary predictions in the field.***”

In the second edition of the book, Darwin added that in the interim “***This belief of mine has been ridiculed by some entomologists***, but we now know from Fritz Müller that there is a sphinx-moth in South Brazil which has a proboscis of nearly sufficient length, for when dried it was between ten and eleven inches long.”

Ivo Vegter (a South African “columnist, speaker, author”) asserted on 17 May 2017 in the Opinion Piece of *FIRST THING* on *The power of scientific predictions*.[140]

> “One is the case of an orchid, ***Angraecum sesquipedale***, endemic to Madagascar. When a specimen was sent to Charles Darwin, he noted its exceptionally long spur, at the bottom of which its nectar could be found. “I have just received such a Box full from Mr Bateman with the astounding ***Angræcum sesquipedalia*** with a nectary a foot long,” he wrote. “Good Heavens what insect can suck it?”
>
> ***The theory of evolution predicted that a moth with a foot-long proboscis must exist***. In an 1862 publication on orchids, he developed the hypothesis that the orchids and moths **co-evolved in a sort of “arms race”**, as orchids with shorter spurs would give up their nectar without achieving pollination and moths with shorter probosces would fail to reach the ever-lengthening spur**. Alfred Russel Wallace** supported Darwin’s hypothesis, writing: “That such a moth exists in Madagascar **may be safely predicted**; and naturalists who visit that island should search for it with as much confidence as astronomers searched for the planet Neptune – and they will be equally successful!”
>
> ***Several anti-evolutionists disparaged these predictions, claiming that the species had supernatural origins.*** In 1903, 41 years after the prediction, and 21 years after Darwin’s death, a moth known as

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[136] https://en.wikipedia.org/wiki/Angraecum_sesquipedale (retrieved 9 July 2018). Ridicule story: even though the author cites the original paper by Arditte et al.

[137] https://www.independent.co.uk/voices/comment/nature-studies-the-madagascar-orchid-and-the-extraordinary-moth-that-goes-with-it-9297560.html

[138] https://www.britannica.com/animal/hawk-moth#ref926563 and briefly at https://www.britannica.com/plant/orchid/Natural-history#ref596544

[139] https://www.theguardian.com/science/lost-worlds/2013/oct/02/moth-tongues-orchids-darwin-evolution

[140] http://firstthing.dailymaverick.co.za/article?id=76957#.WyjX-sRCT-g

> Morgan's sphinx moth was discovered, which fit the bill (sic!). It was named *Xanthopan morganii praedicta*, in honour of the prediction."

However, in spite of painstaking scientific and historical research (Arditte et al. 2012)[141], these "*several anti-evolutionists*", which are said to have "*disparaged these predictions*", or Darwin's ridiculing *entomologists*, or – as the *Wikipedia* notes – "*For some time after this prediction the notion of a pollinator with a 35 cm long proboscis was ridiculed and generally not believed to exist*" – well, all these 'creationists' and 'anti-evolutionists' **have, in fact, never been identified**[142].

Nevertheless, the story about the not so wise 'anti-evolutionists' seems, at least, to fit well within the neo-Darwinian lobbying tasks.

Left: ***Xanthopan morganii praedicta*** and ***Angraecum sesquipedale***
"The hawk moth *Xanthopan morganii praedicta* uses its long, specially adapted proboscis to pollinate the Madagascar star orchid (*Angraecum sesquipedale*) Minden Pictures/SuperStock"
From Encyclopaedia Britannica (retrieved 10 July 2018)[143]
Right: *Angraecum sesquipedale* from https://de.wikipedia.org/wiki/Angraecum_sesquipedale according to botanist Louis-Marie Aubert du Petit-Thouars (1758-1831) Paris, 1822 (*sesquipedale* meaning one and a half foot regarding the spur[144])

The faculty member(s) of Tufts University emphasized (2001/2005/2017)[145] that "Darwin concluded that the spur had evolved its length as an ***arms race***" in a ***gradualistic scenario***.

(1) I would like to point out that the reader should be definitely aware of the fact that, instead of a true history on the origin of these species, up to now, ***three*** rather contradictory ***natural selection models*** have been proposed to explain the **postulated gradualistic arms race** (Darwin 1862/1882) and Wallace (1867)[146], Thomas Belt (1874)[147], Lutz Thilo Wasserthal (1997, 2014[148]. Much of it consists of preliminary

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[141] Arditte J, Elliott J, Kitching I Wasserthal L T (2012): (PDF) 'Good Heavens what insect can suck it'– Charles Darwin, Angraecum sesquipedale and Xanthopan morganii praedicta. Available from: https://www.researchgate.net/publication/263753374_%27Good_Heavens_what_insect_can_suck_it%27-_Charles_Darwin_Angraecum_sesquipedale_and_Xanthopan_morganii_praedicta

[142] Of this story, only the vague "possibility that ridicule may have been verbal, perhaps friendly, in discussions between Darwin and entomological friends or colleagues" remains. – Very weak justification, yet a good man who was first ridiculed but was right after all, receives, of course, our special sympathies.

[143] https://www.britannica.com/animal/hawk-moth#ref926563

[144] Die Gattung *Angraecum* wurde 1804 von Jean Baptiste Bory de Saint-Vincent aufgestellt. Er bildete den Namen *Angraecum* von dem malaiischen Wort „angrek", welches in Südostasien verschiedene Orchideen bezeichnet. https://de.wikipedia.org/wiki/Angraecum

[145] http://answersinscience.org/about.html

[146] Both: **linear** evolutionary arms race.

[147] "…suggested that the spur grew long in order to prevent other moths with shorter proboscises from drinking the nectar."

evolutionary assumptions (partly excluding each other). I refer the reader interested in the details to the *Wikipedia* article mentioned above and to the original literature.

To reformulate in this context a famous verdict of Francis Crick: Biologists must ***constantly keep in mind*** that what has been presented as undeniable evolutionary fact was often nothing but naturalistic just-so stories, looking plausible, yet being untestable.[149] Stephen Jay Gould: "Plausible scenarios are easy to construct." Also: "But a plausible story is not necessarily true."

"I hope that the evolutionary researchers have learned by now that plausible stories are at best hypotheses that should be testable." Prof. V. (Botany)[150] to WEL.

(2) Now, let's assume that in spite of their fundamental non-testability, any of the gradualistic scenarios (or a combination of them) concerning natural selection sifting and adding up an almost infinite number of mutations with 'slight or even invisible effects on the phenotype' etc. (see above) in millions of years, were at least basically and principally true.

So, let's take a normal orchid with a spur a bit longer than that of most of the other orchids. Its reproduction/propagation must have been guaranteed, otherwise it would not have existed.

To get a spur of **35 cm**[151] length from one of say 5 cm (how ever it has become that long[152]) by Darwin's and the neo-Darwinian's view of evolution (additive typogenesis) – to recall this perhaps most basic point of gradualism here – **by** "*innumerable* slight variations", "*extremely* slight variations", "*infinitesimally* small inherited variations", "infinitesimally small changes", "infinitesimally slight variations", "insensibly fine steps", "insensibly fine gradations", "for natural selection can act only by taking advantage of slight successive variations; ***she can never take a leap***, but must advance by the shortest and slowest steps" (see more above, plus further footnotes) – well at least 3,000 links of 0.1 mm each were necessary (if steps of 0.1mm already correspond to "infinitesimally small changes" – in the case of 0.01 mm 30,000 links and 0.001 mm 300,000 links etc.).

And for the average proboscis length of 22 cm[153] *Xanthopan morgani praedicta* 'mother nature' correspondingly would have had to generate at least

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[148] Wasserthal L T https://onlinelibrary.wiley.com/doi/full/10.1111/j.1438-8677.1997.tb00650.x [pollinator shift hypothesis; Wikipedia: "…hawk moths could have evolved long proboscises as a predatory avoidance strategy from heteropodid spiders."]

[149] Full original quote: "Biologists must constantly keep in mind that what they see was not designed, but rather evolved. It might be thought, therefore, that evolutionary arguments would play a large part in guiding biological research, but this is far from the case. **It is difficult enough to study what is happening now. To figure out exactly what happened in evolution is even more difficult**. Thus evolutionary achievements can be used **as hints to suggest possible lines of research, but it is highly dangerous to trust them too much**. It is all too easy to make mistaken inferences unless the process involved is already very well understood." https://en.wikiquote.org/wiki/Francis_Crick / Or Michael Behe on just-so stories: "Some evolutionary biologists - like Richard Dawkins - have fertile imaginations. Given a starting point, they almost always can spin a story to get to any biological structure you wish."

[150] Original German text: „Ich hoffe nämlich, dass die Evolutionsforscher inzwischen gelernt haben, dass plausible Geschichten bestenfalls Hypothesen sind, die testbar sein sollten."

[151] According David Attenborough up to 50 cm (1995, p. 104): Das Geheime Leben der Pflanzen. Bertelsmann, Wien. Other measures: "The spur of the flower is 27–43 cm (10.6–16.9 in) from its tip to the tip of the flower's lip." https://en.wikipedia.org/wiki/Angraecum_sesquipedale ("In a paper published by Wasserthal in 1997 he quoted a spur length of 33.3±4.6 cm (N=15). The spur was measured from the rostellum at the spur entrance to the end of the spur lumen.) to explain the differences, I would like to suggest that modifications due to differences of soil, temperature, light and futher factors could play a role here.

[152] See, however, in PartII the objection by George Campbell, Duke of Argyll.

[153] "Among the flowers studied the height of the nectar column was always such that an *X. morganii praedicta* with an **average proboscis length (22 cm)** could reach it (Fig. 11E; Tables 2, 4; Wasserthal, 1997)." Arditti et al. 2012:´https://academic.oup.com/botlinnean/article/169/3/403/2416123

something between 2,000 to 200,000 transitional links, starting from a 2 cm long proboscis.

A putative comparison: According to Simpson the extent of increase of tooth length in horses amounted to only some 1 mm per million years. For similar values for the height of the giraffe by contemporary authors, see Lönnig 2011[154].

Applying this gradualistic yardstick to the orchid and its moth – for "*infinitesimally* small inherited variations" etc. are, of course, also relevant for plants and insects – would mean at least ***some 300 million years*** for the evolution of the long spur of *Angaecum sesquipedale* and about ***200 million years*** for the continuous origin of the proboscis of *Xanthopan morganii praedicta*, yet in that case the latter would be 100 million years younger than the former – a not too modest discrepancy.

However, according to the fossil record just the exact opposite seems to be true: The oldest proboscis wearing moth fossil so far detected is dated to be 201 million years old, but "Mysteriously, ***the fossilized insect remains turned out to be more than 70 million years older than the oldest known fossils of flowering plants***, throwing a monkey wrench into how the co-evolution between flowers and their pollinating insects occurred." And Doyle Rice (2018)[155] continues to report on the reactions to the original paper of van Eldijk et al. (2018)[156]:

> "The consensus has been that insects followed flowers," said Boston College research professor Paul K. Strother, co-author of the study published Wednesday in the peer-reviewed journal Science Advances. "But that would be 50 million years later than what the wings were saying. It was odd to say the least, that there would be butterflies before there were flowers."

A monkey wrench into the other direction of co-evolution of 70 million years would not be too easily negligible either – at least not for the general theory of evolution. Nevertheless, in this case one could, of course, argue that the moths were already in a good starting position to co-evolve with the orchids. The problem only is that such enormous eons of time of 131 million years were not available neither for the evolution of these *Angraecum* orchids – at the utmost 41 resp. 39.4 million years (Eocene) – nor for the *Xanthopan* moths within the Sphinginae – 26.4 resp. 23 million years (Oligocene), according to Netz and Renner 2017[157]. In that case, these long proboscis moths were 14.6 resp.16.4 million years late (another not so optimal starting point).

(3) Now, let's have a brief look at the implications of co-evolution according to the neo-Darwinian view of evolution. So, let's start with a *minimum* of 3,000 links for the evolution of the spur and 2.000 for the proboscis. Considering the data given above on natural selection and Haldane's dilemma including the

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[154] http://ad-multimedia.de/evo/long-necked-giraffe_mU.pdf

[155] https://eu.usatoday.com/story/tech/science/2018/01/11/worlds-oldest-butterfly-and-moth-fossils-worlds-oldest-butterfly-and-moth-fossils-discovered-200-mil/1024442001

[156] Timo J. B. van Eldijk,Torsten Wappler, Paul K. Strother, Carolien M. H. van der Weijst, Hossein Rajaei, Henk Visscher, Bas van de Schootbrugge (2018): A Triassic-Jurassic window into the evolution of Lepidoptera http://advances.sciencemag.org/content/advances/4/1/e1701568.full.pdf

[157] Netz C and Renner S S (2017): Long-spurred Angraecum orchids and long-tongued sphingid moths on Madagascar: a time frame for Darwin'spredicted Xanthopan/Angraecum coevolution. *Biological Journal of the Linnean Society* **122:** 469–478. "Madagascan subspecies X. morgani praedicta and the African subspecies X. morgani morgani diverged 7.4 ± 2.8 Mya, which overlaps the divergence of A. sesquipedale from its sister, A. sororium, namely 7.5 ± 5.2 Mya."

waiting time problem, we would come – in a rough approximation – to billions of years surpassing the age of the earth multiple times for each, the orchid and the moth individually (it could be interesting for a mathematically minded researcher to make more concrete calculations for these problems). However, the *coordination* of the growth rates of spur and proboscis would not have been taken into account yet. Would each of the thousands of “infinitesimally small steps” (with hardly any selective advantages) towards the elongation of the spur, be really followed by a correspondingly “insensibly fine step” (with equally doubtful selective advantages) in the length of the proboscis? Recall, please, also that “a mutation that is 1 percent better in fitness than the standard allele in the population will be lost 98 percent of the time by genetic drift” – overlapping modifications etc. (see above) not yet weighed in. Improbabilities multiply almost endlessly here. Inference: The whole (neo-) Darwinian approach appears to be, in fact, more than doubtful.

(4) So, what about intelligent design (ID)? Since there are, at least so far, no data for any new irreducibly complex structures or advanced specified complexity generating the extended length of the spur and the proboscis, the question may be raised whether perhaps just quantitave differences/primarily monodimensional changes may be involved here (such adjustments seem to belong to what renowned botanist Wilhelm Troll called “the law of variable proportions”[158]) – that is, whether the adaptions are well within the possibilities and limits of natural law.

But, of course, we cannot exclude future proofs that here, too (perhaps by orphan genes?) “There must have been a steady input of new information which we have ascribed to the activity of Creative Intelligence, so raising the level of organisms step by step to ever higher and higher levels of complexity”?[159]

Yet, the simplest answer would be Mendelian recombination of several genes in accord with the presence/absence theory.[160] I am deeply impressed by the ***regular recurrence*** of short to long spurs in the ca. 225 species of the genus *Angraecum* (additionally there are almost 50 interspecific hybrids and 14 intergeneric hybrids so far[161]). The variation shown by Netz and Renner (2017, p. 475) ranging from 0 mm (*Angraecum corrugatum*, *A. appendiculatum* on Reunion) to maximally 430 mm in *A. sesquipedale* in Madagascar. Most of the differences in length arose ***independently of each other*** in the respective species.

Research project: Thus, it would now be very interesting to know what has been happening on the corresponding DNA levels in the orchids and moths concerned. In my book about the domestic dog I have postulated a testable DNA based

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[158] Gesetz der variablen Proportionen. See also Oskar Kuhn http://docplayer.org/72037514-Goethes-naturforschung.html

[159] Cell biologist Edmund Jack Ambrose; *cf.* http://www.weloennig.de/AesIV4.html

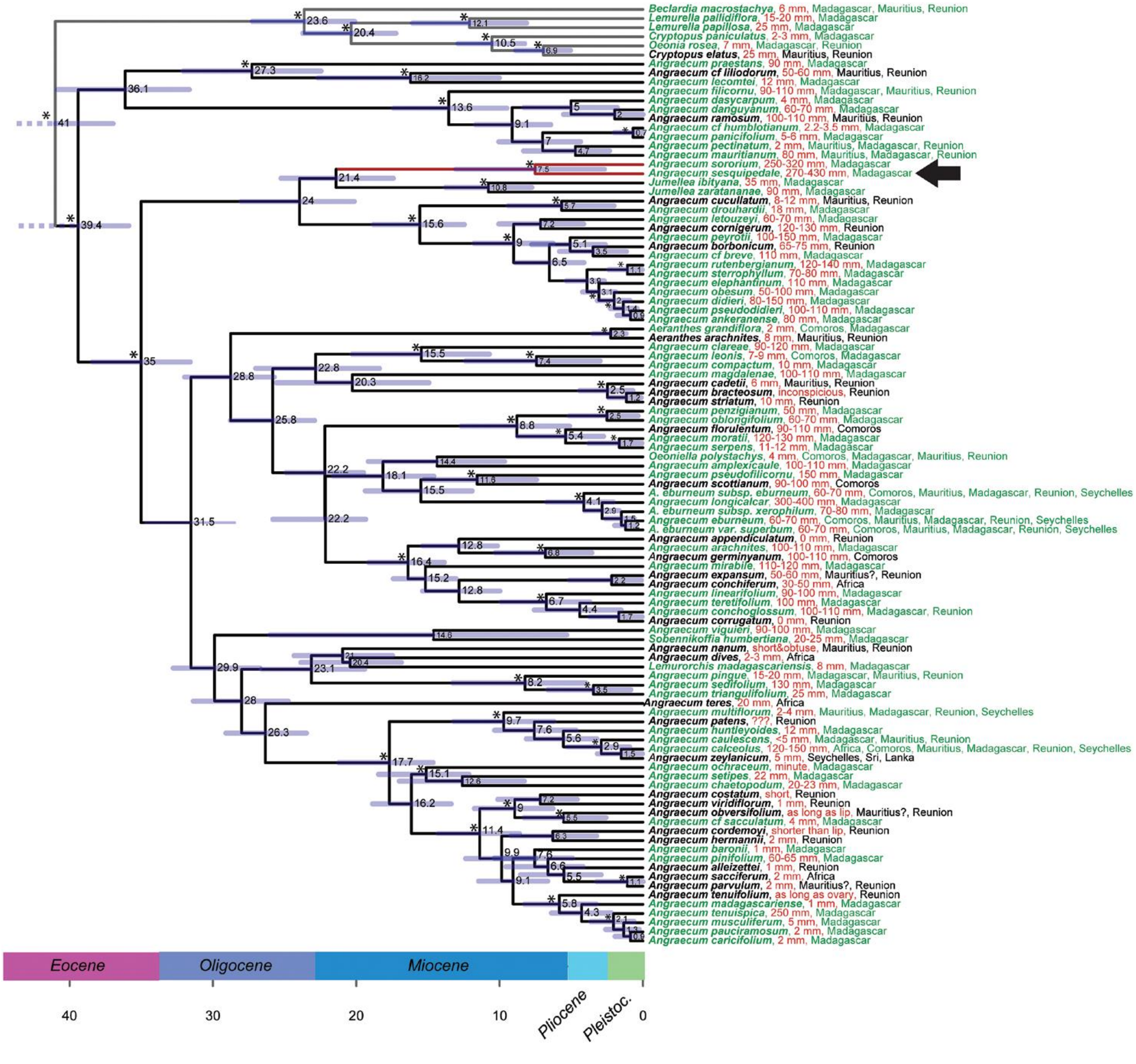
[160] See the details on this topic at www.weloennig.de/AesV1.1.Dege.html and www.weloennig.de/AesV1.1.Droa.html and as for mutations: www.weloennig.de/Gesetz_Rekurrente_Variation.html

[161] 46 interspecific hybrids are enumerated in https://en.wikipedia.org/wiki/Angraecum and 14 intergeneric hybrids at https://de.wikipedia.org/wiki/Angraecum (both retrieved 11 July 2018).

regulatory system adapting organisms in rather short periods of time to new environmental conditions by sometimes quantitatively small but often also larger steps, including transposable elements (TEs), single nuclear polymorphisms (SNPs) as well as copy number variations (CNVs), i.e. segments of DNA duplicated or deleted; see, please, http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf pp. 176-179, 186-193, 205-207, 350, 371/372.

Figure 3 of the scientifically excellently researched paper by Netz and Renner (2017, p. 475) referred to above, with the accompanying explanatory text:

> "Chronogram for the Madagascan *Angraecum*, with the species and subspecies occurring on Madagascar, shown in green. Numbers at nodes refer to node ages (Mya), each with its 95% highest posterior probability (PP) interval shown as a pale blue bar. The three species with the longest spurs (20–33 cm long) are *Angraecum sesquipedale*, *An. longicalcar* and *An. sororium*. The tree is based on the nuclear intergenic spacer region *ITS* and the plastid *matK* gene and *rps16* intron. Asterisks mark nodes with 98% PP."



Large variation has also been detected in the length of the proboscis of the Sphinginae ranging from 7 mm in *Isoparce cupressi*, USA, to 280 mm in *Amphimoea walkeri*[162], Costa Rica and Mexico to Argentina), the latter being ca. **63 mm longer**

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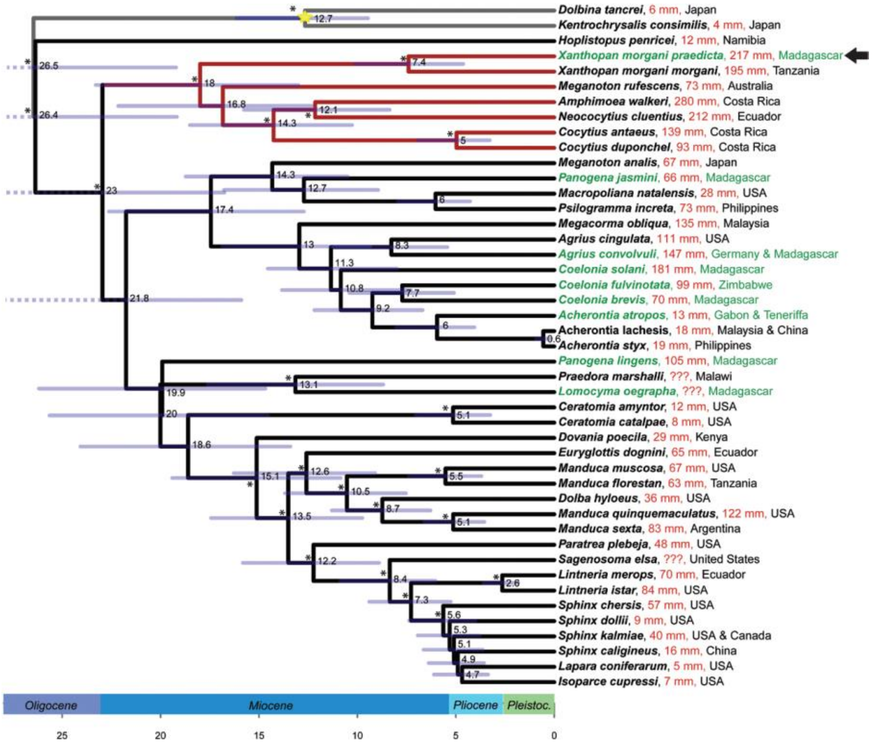
[162] Bill Oehlke (2017): "Adults are on wing year round. They have the longest insect proboscis in the world, **and nectar from deep-throated flowers as Angel's Trumpet, *Brugmansia arborea*** while hovering in the air." http://www.danske-natur.dk/bolsph.htm (retrieved 12 July 2018)

than in *Xanthopan morgani praedicta* (**217 mm**): "[Adults of ***Amphimoea walkeri***] have the ***longest insect proboscis in the world*** and [collect] nectar from deep-throated flowers while hovering in the air."[163] Or in the words of a peer-reviewd paper by Bowder et al. (2014, p. 69): "Among insects, the ***world record holder*** concerning ***absolute proboscis length is Amphimoea walkeri*** (Boisduval [1875]) (Sphingidae). The proboscis of this Neotropical hawk moth measures up to **280 mm** (Amsel, 1938)."[164]

Just to convey a first impression how these moths look like at all: Left: *Amphimoea walkeri* Photograph by Konstantin Kraevsky[165].
Left (second photo) also *A. walkeri* Wikimedia Commons[166]. Middle and Right: *Xanthopan morgani praedicta* according to French Wikipédia[167]

Figure 2 by Netz and Renner (2017, p. 474) with accompanying explanatory text:

"Chronogram for the Sphinginae, with the species and subspecies occurring on Madagascar, shown in green. Numbers at nodes refer to node ages (Mya), each with its 95% highest posterior probability (PP) interval shown as a pale blue bar. The tree is based on a matrix comprising the mitochondrial gene *COI* and five nuclear genes (Material and Methods). Asterisks mark nodes with 98% PP."



Many of the differences in the length of the Sphingidae proboscises have also arisen independently of each other. "Madagascar harbours *c*. 30 species of long-

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[163] http://www.wikiwand.com/en/Amphimoea_walkeri

[164]Bauder J A-S, Warren A D, Krenn H W (2014): Evolution of extreme proboscis lengths in Neotropical Hesperiidae (Lepidoptera). Journal of Research on the Lepidoptera (J Res Lepid): 47: 65-71.

[165] http://insecta.pro/taxonomy/16411

[166] https://commons.wikimedia.org/wiki/File:Amphimoea_walkeri_zsm.jpg

[167] https://fr.wikipedia.org/wiki/Xanthopan_morganii (the latter two retrieved 12 July 2018)

spurred orchids and seven species of long-tongued hawkmoths" (Netz and Renner, 2017, p. 469). "However, those hawkmoths with extremely long probosces were never recovered as a monophyletic group" (Ian J. Kitching 2002, p. 471)."[168]

For respective further research questions, see please above.

Summary of and some additions to my critical remarks concerning "Darwin's orchid" *Angraecum sequipedale* and the moth *Xanthopan morgani*:

(a) Darwin's falsification criterium for his theory is hardly ever mentioned in relation to the origin of orchids in general. Although in the present case a rewarding orchid species is discussed, his fulfilled falsification criterium questions his entire selection theory and is thus also relevant for the *Xanthopan morganii praedicta*/*Angraecum sesquipedale* case.

(b) Darwin's prediction of 1862 was correct *("…in Madagascar there must be moths with probosces capable of extension to a length of between ten and eleven inches!*"[169]), so he may be praised/commended/applauded for that prediction at a time when not so much was known about such moths (see, however, below). Yet, the decades long worldwide hype appears to be strongly exaggerated and motivated less by science than by the dominating materialist Zeitgeist and seems to be inappropriate because:

(c) Francis Walker from the British Museum had described *X. morgani* [*Macrosila morganii*] already in **1856**[170] and remarks on p. 78: "***Proboscis longissimi***"; on p. 198 also in Latin as well as English: "***Probiscis very long***."[171] (On p. 211 a similar note for the genus *Sphinx* – hawk moth: "***Proboscis longissima***", also in English "***Proboscis very long***". Even the European *Sphinx convolvulus*, now *Agrius convolvuli* L., displayed a proboscis up to **139 mm** long. It was known at least since 1758[172].)

Agrius convolvuli. Photographs by Charles J Sharp. Gorski kut, Rila Monastery, Bulgaria

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[168] https://academic.oup.com/zoolinnean/article-abstract/135/4/471/2624241?redirectedFrom=PDF

[169] http://darwin-online.org.uk/content/frameset?itemID=F800&viewtype=text&pageseq=1

[170] Arditti et al (2012): "What may be the earliest description of a moth which could be related to, or resemble, *Xanthopan morganii praedicta* was published in 1832 under the generic name *Amphonyx* by a Cuban zoologist named Felipe Poey y Aloy (1799–1891; Poey y Aloy, 1832). *Amphonyx* is now considered to be a synonym of **Cocytius** (Rothschild & Jordan, 1903). Another generic name, *Protoparce* (Burmeister, 1856), which was applied to Brazilian moths by the German entomologist Karl Hermann Konrad Burmeister (1807–1892) is also now a synonym of Manduca. In 1856 the controversial British Museum entomologist Francis Walker (1809–1874) erected a new genus *Macrosila*, now also a synonym of *Manduca* (Walker, 1856) and in it described Xanthopan morganii (Fig. 7A–C) as ***Macrosila morganii***." See again: https://www.researchgate.net/publication/263753374_%27Good_Heavens_what_insect_can_suck_it%27-_Charles_Darwin_Angraecum_sesquipedale_and_*Xanthopan_morganii_praedicta* [accessed Jul 12 2018].

[171] *Cf.* https://www.biodiversitylibrary.org/item/120096#page/90/mode/1up Unfortunately, however, he did not give numbers in say cm or inch.

[172] https://en.wikipedia.org/wiki/Agrius_convolvuli#/media/File:Convolvulus_hawk-moth_(Agrius_convolvuli)_2.jpg
https://de.wikipedia.org/wiki/Windenschw%C3%A4rmer (retrieved 16 July 2018)

Moreover, every botanist knew that orchids were, *inter alia*, visited and pollinated by insects including many different moth species. And Darwin himself noted in the second edition of his book 1877, p. 163: "*…we now know from Fritz Müller* [two or three years after 1862] *that there is a sphinxmoth in South Brazil which has a proboscis of nearly sufficient length, for when dried it was between ten and eleven inches long*."[173]

(d) There is no documentation for his statement "This belief of mine [long proboscis] has been ridiculed by some entomologists". None of the 'creationists' can be cited to have ridiculed him – as Arditti et al. have documented in painstaking detail. And no 'creationist' can be shown to have denied this prediction.

(e) Selection models. Since they all presuppose certain hypotheses about evolutionary starting points and the unrestricted power of natural selection, all the models so far presented remain doubtful – not to mention that they contradict each other to a certain extent.

Anna Vlašánková et al. (2017)[174]:

> "Both Darwin's coevolutionary race hypothesis (Darwin, 1862) and the pollinator shift hypothesis (Wasserthal, 1997; Whittall & Hodges, 2007) predict that during evolution of long-spurred flowers, the short-proboscid pollinators are excluded from the pollination system, and the long-proboscid pollinators are expected to be the only ones producing selection pressure on flower traits. By contrast, our results show that even visitors with shorter proboscises can be effective pollinators and that the possible selection pressures on flower traits can therefore be much more diverse."

(f) Arms race and fine-tuned co-evolution: As already noted above (see point (3)), the ***linear*** evolutionary arms race envisioned by Darwin and Wallace presupposes that ***each step*** of the thousands of "infinitesimally small inherited variations" (random micro-mutations) in this assumed continuous evolutionary spur elongation process in *Angraecum sesquipedale*, was followed by the selection of an exactly compensating "infinitesimally small change" (in the long run excluding overlapping modifications and all other possible pollinators) in the proboscis of *Xanthopan morgani* resulting in fine-tuned co-evolution up to the present state of things. Thus, we would have to postulate precisely adjusted and perfectly calibrated co-evolution by accidental DNA sequence alterations in two totally different anatomical structures of two entirely distinct/disparate organisms genetically independent of each other! See above the problems for such additive random micro-mutations focusing on just one special anatomical feature each and the improbabilities of "omnipotent" natural selection. "*Thus, it would appear that there has been a race in gaining length between the nectary of the Angræcum and the proboscis of certain moths; but* ***the Angræcum has triumphed****…*" (*cf*. Darwin above). What about testability?

(g) Mendelian recombination: Since there are already a series of successful interspecific crosses and hybrids in the genus *Angraecum*, it should not be too difficult to obtain the first results in a segregating F_2 on the real number of genes

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[173] http://darwin-online.org.uk/content/frameset?itemID=F801&viewtype=text&pageseq=1

[174] Anna Vlašánková, Eliška Padyšáková, Michael Bartos, Stěpán Janeček (2017): The nectar spur is not only a simple specialization for long-proboscid pollinators. *New Phytologist* 215: https://nph.onlinelibrary.wiley.com/doi/pdf/10.1111/nph.14677

involved in the differences between long and short spurs. So here we have already the first possibility to test this question. The second step would be to tag and clone the genes involved in the length differences. Perhaps a similar procedure might be possible for *Xanthopan morgani*.

(h) Contradictory time frames: See, please, the details above. As to the geological age of the orchids (long thought to be relatively young), it could be added that "A newly published study [of 2017] documents evidence of an orchid fossil trapped in Baltic amber that dates back some 45 million years to 55 million years ago, shattering the previous record for an orchid fossil found in Dominican amber some 20-30 million years old"[175]. And according to a more popular source (2007):

> "To Bee or Not to Bee – Bee provides Clue to Orchid Origins. The picture [below] clearly shows the pollen grains preserved on the back of the worker bee. The bee has been identified as a *Proplebeia dominicara* an extinct species but a close relative to modern bees. The distinctive orchid pollen has been classified to belonging to *Meliorchis caribea*. Using the DNA extract scientists have been able to calculate the age of the orchid family with greater accuracy, placing the origin of the orchid at between 84 mya to 76 mya (Campanian stage of the Late Cretaceous)."[176]

Left: Fossil bee *Proplebeia dominicara*: Mesoscutellum with orchid pollen of *Meliorchis caribea*. Right: "A fungus gnat trapped in amber some 45-55 million years ago is carrying on the upper portion of its severed leg a pollen sac from an orchid [*Succinanthera baltica*] – the oldest evidence of the flower ever discovered. Credit: Oregon State University." Text by anonymous author(s) of Oregon State University.

See, please, footnote for the original paper by George Poinar and Finn N. Rasmussen (2017).[177]

For the time being, so much for Part I.

Part II is going to discuss especially the question raised by Douglas J. Futuyma (see, please, above): "We may wonder how an advocate of "intelligent design," i.e. creationism, might explain pseudocopulatory pollination." At present I'm working on this topic. Nevertheless, some hints have already been given by the citations of Karl von Goebel, Wilhelm Troll, Wolfgang Kuhn, and Robert Nachtwey above. But there are more points which have to be examined.

See, please http://www.weloennig.de/BeautifulFactsPartII.pdf

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[175] https://phys.org/news/2017-05-evidence-oldest-orchid-fossil.html
Original article: Santiago R. Ramırez, Barbara Gravendeel, Rodrigo B. Singer, Charles R. Marshall, Naomi E. Pierce (2007): Dating the origin of the Orchidaceae from a fossil orchid with its pollinator. *Nature* **448**: 1042-1045.
https://www.researchgate.net/publication/6111228_Dating_the_origin_of_the_Orchidaceae_from_a_fossil_orchid_with_its_pollinator

[176] https://blog.everythingdinosaur.co.uk/blog/_archives/2007/08/31/3196363.html (both retrieved 14 July 2018)

[177] See the original (full) article bei Poinar, Finn and Rasmussen (2017): Orchids from the past, with a new species in Baltic amber. Botanical Journal 183: 327-333) at https://academic.oup.com/botlinnean/article/183/3/327/3092413

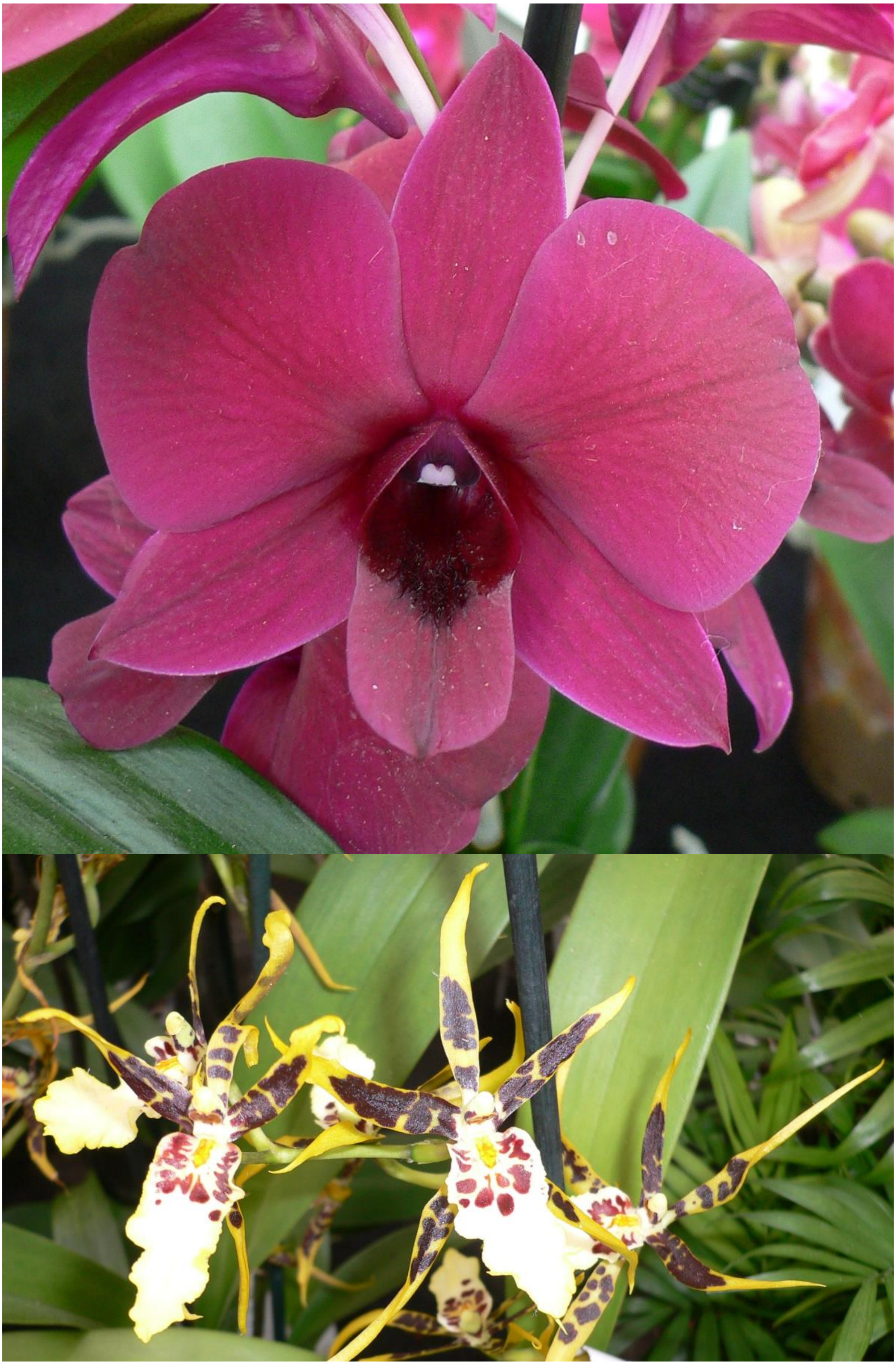
Reiteration of the photos shown above followed by a series of enlargements and names of the genera

Above: *Phalaenopsis* hybrid (*Phalaenopsis* belongs to the deceit pollinators, thus offering no reward). Below: *Oncidium* flower (also non-rewarding).

Vanda coerulea hybrid (pollination by sexual deception; high percentage of *Vanda* species nectarless)

Phalaenopsis hybrid (pollination by deceit)

Above: Flower of *Phalaenopsis* hybrid enlarged. Below: *Dendrobium* hybrid (*Dendrobium*: Both, deception and rewards)



Above: Flower of *Dendrobium* hybrid.
Below: *Brassia* (strategy: deceit)

Psychopsis hybrid (below enlarged, pollination strategy still not observed?)

Above: Roots of *Phalaenopsis* hybrid. Below: *Dendrobium* hybrid (note especially the rather large vegetative parts of the plant)

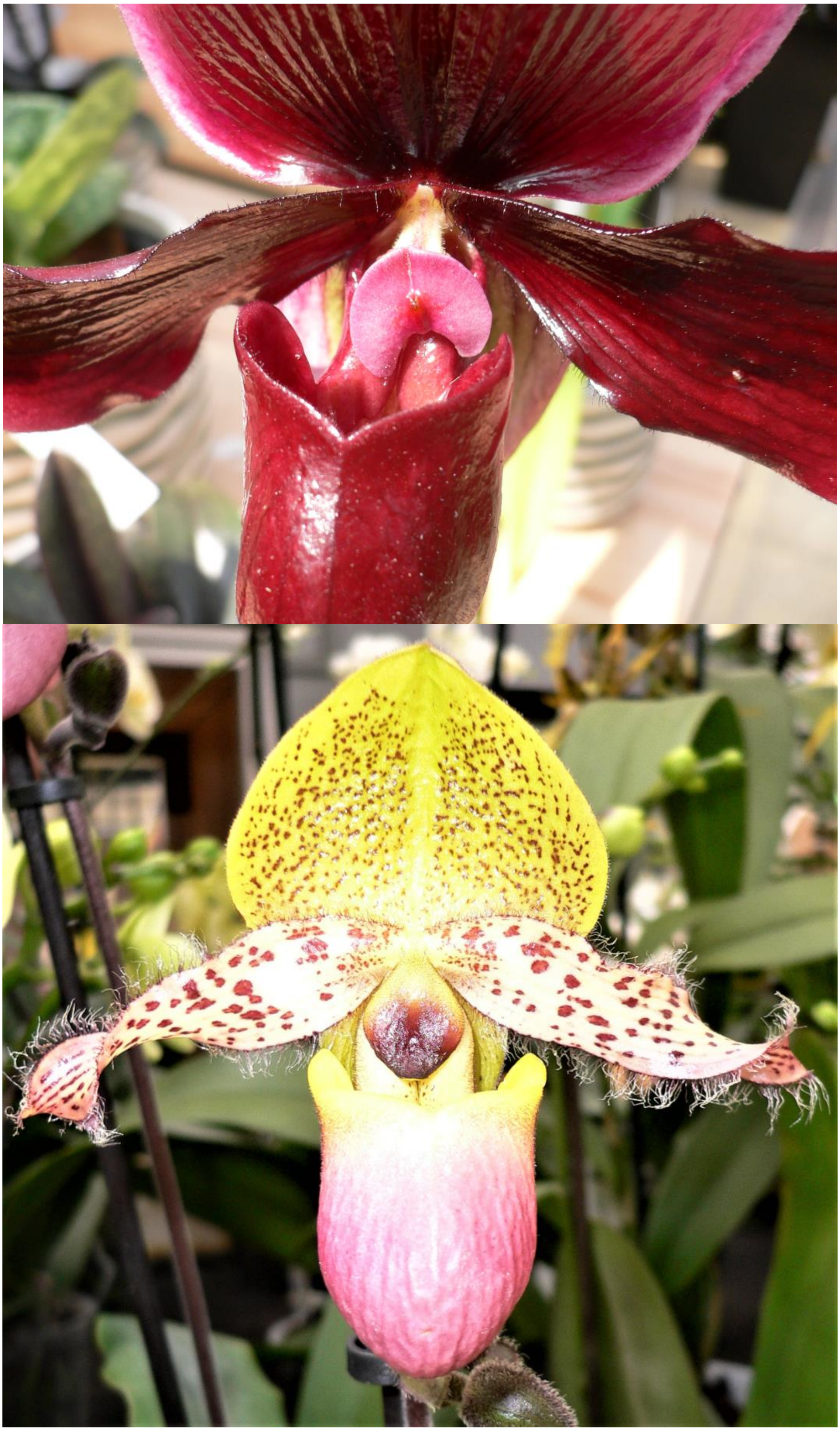
Dendrobium hybrid: Vegetatvive parts (above: seen from higher in position; below: seen from the side)

Dendrobium hybrid (also with focus on vegetative parts)

Above: *Oncidium* hybrid. Below left: *Miltonia* hybrid showing especially the vegetative part. Right: vegetative part of *Phalaenopsis*

Flowering *Miltonia* hybrid

Above: Single Flower of *Miltonia* (deceit?) hybrid enlarged.
Below *Paphiopedilum* (pollination without known reward for the insects)



Above: Detail of *Paphiopedilum* flower.
Below: *Phragmipedium longi* (deceit-pollination system)

Above: Single Flower of *Dendrobium* (detail). Below: *Denrobium* hybrid flowers and vegetative parts.

Above: Single Flower of *Dendrobium* hybrid. Below: Inflorescence of *Phalaenopsis* hybrid

Above: *Cattleya* flower (pollination mostly by deceit). Below: *Epidendrum* hybrid (*Epidendrum*: both nectar-secreting and nectarless species)

Epidendron hybrid including vegetative parts

Above: Flower of *Epidendrum* hybrid. Below: *Dendrobium* hybrids: Flowers white (on the left) and red (on the right, showing also vegetative parts)

Above: Left: Flower of *Paphiopedilum* hybrid (rewardless). Right: Vegetative part of that hybrid. Below: Inflorescence *Phalaenopsis* hybrid

Above*:* Flower of *Vanda coerulea* hybrid (now in orange). Below: Inflorescence of *Phalaenopsis* hybrid

All genera determinations and their hybrids according to Dinger's Garten Center, Cologne. Also checked against several authoritative orchid sources.

All photographs by Wolf-Ekkehard Lönnig

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