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The Deceptive Flowers of
Orchids
and Evolution by
Natural Selection
Or How More than Eight Thousand Beautiful Facts
are Slaying an Ugly Hypothesis¹: Darwinism²
Part II: Intelligent Design

“The progress of evolution walks over **billions of corpses.**”³

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 Neuhäusler⁴

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.**”⁵

Sir David Attenborough

¹Reformulating 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>

² “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>

³Original German sentence: “Der Fortschritt der Evolution geht über Milliarden von Leichen.”

⁴https://de.wikipedia.org/wiki/Anton_Neuhäusler

⁵Context: 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 achieved. 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.

Main Points for Part II

“Design theorists *do not deny that mutational processes might have degraded some previously functional DNA*, but we have predicted that the functional DNA (the signal) should dwarf the nonfunctional DNA (the noise), and not the reverse.”

Stephen C. Meyer

Part I (*cf.* <http://www.weloennig.de/BeautifulFactsPartI.pdf>) closed as follows:

“PartII is going to discuss especially the question raised by Douglas J. Futuyma: “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.”

The first question, which may be raised for the validity of theory of intelligent design, could, perhaps, be concerned with functionality. Interestingly the following facts, which have been recently detected by a group of researchers, appear to be relevant to partially answer that question:

Małgorzata Stpiczyńska et al. (2018) detected in *Epidendrum* “the presence of secretory activity in species generally regarded to be rewardless”:

“Our study indicates that *all investigated species produce nectar or nectar-like secretion to varying degrees*, and no alternative pollinator food-rewards were observed. Even though macroscopic investigation of presumed rewardless species failed to reveal the presence of secretion within the cuniculus, *close observations of the cells lining the cuniculus by LM, SEM and TEM revealed the presence of cuticular blisters and surface material*. Moreover, the similarity of both the thick tangential cell walls (with the exception of *E. vesicatum*) and organelle complement of cuniculus epidermal cells in both copiously nectariferous species and those producing only small quantities of surface secretion **confirmed the presence of secretory activity in species generally regarded to be rewardless.**”

[...] Orchids offer their pollinators a variety of floral food-rewards, such as nectar, oil and edible trichomes, with many more producing non-food rewards, such as fragrances, waxes and resins. Based on analyses by Neiland and Wilcock (1998), **the presence of nectar** in both temperate and tropical orchids **can increase their reproductive success** (fruit set).

[...] It should be emphasized that reward-producing and rewardless *Epidendrum* species have so far mainly been distinguished by macroscopic observation for the presence or absence of nectar within the inner spur [References]. Detailed structural studies of the cuniculus are scarce, particularly in species where nectar appears to be absent. This is the *first time for such a detailed investigation* of cuniculus structure to be undertaken for *Epidendrum*.⁶

Also, Xu-Li Fan et al. (2012, p. 957)⁷ – and many authors during the last more than 100 years in accord with them – mention that rewardless species appear to be less frequently visited by their pollinators than the rewarding ones:

“Under these environmental conditions [wet season], as our observations indicate, **visits by pollinators are very infrequent**, a problem that is no doubt exacerbated by the fact that **the species** [*Acampe rigida*] **is rewardless.**”⁸

Emerson R. Pansarin et al. (2012, pp. 850, 859)⁹ on the origin of deceptive systems:

“Shifts between rewarding and deceptive pollination systems have occurred many times in the evolution of the Orchidaceae (Dressler, 1981). *Deceptive systems seem to have been derived from rewarding systems in the family* (Ackerman, 1986).

⁶ Małgorzata Stpiczyńska, Magdalena Kamińska, Kevin L. Davies and Emerson R. Pansarin (2018): Nectar-Secreting and Nectarless *Epidendrum*: Structure of the Inner Floral Spur. See entire article at <https://www.frontiersin.org/articles/10.3389/fpls.2018.00840/abstract>

⁷ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3448421/>

⁸ *Cf.* also <http://www.weloennig.de/BeautifulFactsPartI.pdf>, pp. 12, 14/15, 24, 36/37

⁹ <https://www.sciencedirect.com/science/article/pii/S0367253012001442>

[...] It has been suggested that in Orchidaceae deceptive mechanisms evolved from pollination systems that offered rewards (Dafni, 1984, Ackerman, 1986, Nilsson, 1992). This view has been substantiated in many isolated cases (e.g., Ackerman, 1986, Johnson and Nilsson, 1999, Johnson, 2000), but rarely by studies under phylogenetic aspects (Cozzolino et al., 2001). According to Dressler (1981), shifts from rewarding to deceptive pollination systems may have occurred **many times** along the evolution of Orchidaceae.”

Thus, if the findings of the former article on *Nectar-Secreting and Nectarless Epidendrum: Structure of the Inner Floral Spur* and the insights of the papers cited by Pansarin et al. could be generalized (large research project!) one may infer that – concerning the question of functionality –

- (1) rewardlessness could be a secondary, a devolutionary, a degenerative condition in orchids in agreement with, for example the facts cited by Lönnig¹⁰, Sanford¹¹, Behe¹², Leisola¹³ and many others. Hence, originally, pseudocopulatory pollination seems to have been (not just rewardless as at present but) **rewarding in possibly many more orchid species**. So, concerning the aspect of functionality, what has been elicited so far is this: The origin of rewardless systems appears to be more the result of a process of **detoriation, degeneration, decay and decline** than of improvement, progress and evolution – the exact opposite of what Darwin and his followers had/have in mind.

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. 12¹⁴). 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).**

- (2) As to the act pseudocopulation itself as well as the possibility of originally non-rewarding species, I would like to refer the reader to check carefully the discussion by Markus Rammerstorfer (2006) on the topic of **Spielerische Komplexität**¹⁵.

Let us now critically inspect some further facts on the ID question:

Intelligent Design – an Alternative?

Closed functional circuits of anatomical and physiological components and correspondingly genetic programmes (to a large extent DNA encoded) are obviously necessary for the survival of these individual orchid plant forms and species.

¹⁰ <http://www.weloennig.de/AesV1.1.Dege.html>, https://evolutionnews.org/2014/10/the_dog_delusio/, https://evolutionnews.org/2014/11/wolf_on_dogs_yo/

¹¹ <http://www.geneticentropy.org/latest-development>, <https://www.amazon.de/Genetic-Entropy-John-C-Sanford/dp/0981631606>

¹² Behe, M. J. (2010): Experimental evolution, loss-of-function mutations und the first rule of adaptive evolution. The Quarterly Review of Biology 85: 419-445.

¹³ <https://evolutionnews.org/2018/02/evolution-a-creative-trickster-heretic-bioengineer-says-no/>

¹⁴ Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.

¹⁵ <http://members.livest.at/rammerstorfer/PlayfulComplexity.pdf>

However, neither the emergence of such functionally complete systems, these perfect units usually consisting of multiple indispensable core components, can adequately, i.e. scientifically, be explained by “innumerable slight variations”, “infinitesimally small inherited variations” i.e. by mutational “steps not greater than those separating fine varieties” and “insensibly fine gradations” *principally* assumed by Darwin and the neo-Darwinians alike to have been chosen and preserved by natural selection, nor can the development of refrigerators by aimless factors in Wolfgang Wickler's illustration (*cf.* Part I).

Survival of the fittest only affects the possibilities and limits of variability within the functional systems of a species, whereby functionally largely equivalent (neutral) mutations are likely to play a significant role in the formation of many *morphological* plant and animal species. For some more points on this topic, *cf.* <http://www.weloennig.de/CorCat.html> and <http://www.weloennig.de/Artbegriff.html>. Regarding degeneration under relaxed natural selection, see <http://www.weloennig.de/AesV1.1.Dege.html> as for the limits of mutations http://www.weloennig.de/ShortVersionofMutationsLawof_2006.pdf

If, however, today's theories of evolution cannot scientifically, i.e. testably, answer the fundamental questions about the origin of new synorganized structures and systems and insistently still demand scientific acceptance with great trust and confidence (“evolution is not a theory; it is a fact”), then, where is the difference between an arbitrary request of faith without proof, being on the same level as the opinionated insistence of many churches to accept their respective dogmata?

On the question for an alternative Robert Nachtwey comments¹⁶ (1950, p. 144):

“The orchis flower can not have arisen from the coincidental summation of many discordant details, but only from the systematic assembly of its parts according to plan.”

In many respects, the research on *Coryanthes* and *Catasetum* continues to corroborate Professor Adolf Portmann's¹⁷ conclusion on the origin of the orchids *Goryte* and *Ophrys* (1970, pp. 535, 545, 547 and p. 542, notes in square brackets of mine):

¹⁶Same book as above. Original German Text: Die Orchisblüte kann nicht aus der zufälligen Summierung vieler zusammengewürfelter Einzelheiten, sondern nur aus der planmäßigen Zusammenfügung ihrer Teile entstanden sein.

¹⁷ Renowned Swiss zoologist and philosopher (in the positive sense of the term): https://de.wikipedia.org/wiki/Adolf_Portmann (retrieved 2 July 2018). Original German Text (p. 535): “Die Fülle der Einrichtungen, durch die Orchideenblüten ausschließlich Männchen von Hautflüglern anlocken und als Bestäuber ausnützen, ist erstaunlich vielfältig. Der Weg ihrer Evolution ist in keinem Fall durch Etappen unserem Verständnis [im Sinne des Reduktionismus] zugänglich.”

P. 545: “Die Zweifel an der allgemeinen Geltung dieses Weges [der funktionalen Morphologie] zum Verstehen sind aber nicht leicht zu nehmen. Der Nachweis von Strukturen, die über das funktionsgemäße Ziel hinausschießen, die man deshalb auch als luxurierend, als hypertelisch bezeichnet hat, muß uns jeder allzu weitgehenden funktionalen Deutung gegenüber zurückhaltend stimmen.”

P. 547: “So, wie die Leistungssteigerung durch die Kybernetik nicht etwa die Erfindung des Neuen im menschlichen Dasein erklärt, so erklären auch die bedeutsamen Entdeckungen der Genetik nicht das Auftreten der komplexen Neuerungen, die über das hinausgehen, was die uns bekannten Prozesse genetischer Veränderung uns bisher vor Augen stellen.”

P. 542/543: “Die Entdeckung einer für alle Lebewesen einheitlichen Struktur, einer zur Selbstreplikation fähigen Überträgerin von Information von Schriftcharakter, hat wesentliche Konsequenzen. 1. Sie bestärkt unsere Gewissheit von der Einheit des Lebens, gilt doch das Prinzip für Virusstoffe, Bakterien, Pflanzen, Tiere gleichermaßen. 2. Sie führt damit die Autonomie des Lebens ausdrücklich vor Augen. Die Informationsvorgänge beruhen auf dynamischen Strukturen, die sich wohl der physikalisch-chemischen Stoffe bedienen, die aber selber nicht diesem Bereich angehören. *So kann denn auch die Entstehung des Modus der Vererbung nicht aus den physikalisch-chemischen Strukturen allein erklärt werden.* “Es fragt sich, ob der logische Rang der Zufallsmutationen die Entdeckung neuer Prinzipien einschließt, die im physikalisch-chemischen Bereich nicht fassbar sind. Es ist sehr unwahrscheinlich, dass es solches mit einschließt.” So urteilt ein Philosoph und Soziologe, der aus der strengen Schule der physikalischen Chemie hervorgegangen ist: Michael Polanyi. 3. “Die besondere Struktur dieser besonderen Informationsprozesse, die uns den Vergleich mit unserer schriftlichen Verständigung aufdrängen, lenken den Blick auf die Phänomene, die wir im menschlichen Bereich als geistige Beziehung kennen, die ja auch bei uns nicht auf das wache Bewußtsein beschränkt ist. Die Diskussion um das Problem des Geistigen erhält neue Impulse.”

“In no case is the path of their evolution accessible through stages [of innumerable small micro-evolutionary steps] to our understanding.”

“[T]he doubts about the general validity of this pathway [of functional morphology] for understanding should not be taken easily. The demonstration of structures that overshoot the functional goal, which therefore has been described as luxuriatious [“luxurierend”¹⁸], hypertelic, must make us cautious to any overly broad functional interpretation.”

“Just as increasing efficiency of cybernetics does not explain the invention of the new [des Neuen] in human existence, likewise the significant discoveries of genetics do not explain the appearance of complex innovations that go beyond what the known processes of genetic change have shown.”

“The discovery of a structure that is standardized for all living things, a vector of information displaying the characteristics of hand writing [Schriftcharakter] that is capable of self-replication, has significant consequences.”

And on page 543, Portmann continues:

“The special structure of these specific information processes, which force us to compare it with our written communication, draws attention to the phenomena that we know in the human realm as mental relationships, which are not limited to our alert consciousness. Thus, the problem of the spiritual [des Geistigen] receives new impulses.”¹⁹

According to the facts and arguments presented above, there are numerous scientific reasons to apply the following words on the type concept of the paleontologist Oskar Kuhn and botanist Wilhelm Troll just as well on the subtype of orchids and probably also to the genera *Coryanthes* and *Catasetum*:

“The type is, like any other form, as viewed *bona fide* morphologically²⁰, the realization of a plan into indifferent matter, which could just as well have assumed a different form. As a *Universal*, the type is objectively valid, the essence of things is conceived in it. From the point of view of naturalism, the origin of the types is the greatest mystery because of its nonadaptive character. Together with W. Troll we think that types are to be understood as “the thoughts of a creative power, which flows from the world-background into nature”, which “generating new forms to matter, called into being the type-like basic forms”.”²¹

See also *The Synthetic Theory of Evolution and the Intelligent Design Theory: A Comparison* (discussion of the main objections against ID regarding *Coryanthes* and *Catasetum*): <http://www.weloennig.de/IntelligentDesign.html>

But perhaps one could also think up ‘an exceedingly plausible hypothesis of evolution’ to explain the origin of the orchids, then refute it, to come up with another one, disprove that too etc., *ad infinitum*, ultimately demonstrating only the fundamental nonfalsifiability of the selection theory. Plausible hypotheses need not be true (Gould).

Interestingly, already about 150 years ago The Duke of Argyll has already formulated several objections against Darwin’s hypothesis of a “race in gaining length between the nectary of the *Angraecum* and the proboscis of certain Moths” that have been clearly validated relatively recently:

¹⁸ Something like as superlative of luxuriary – so far I did not find an adequate English expression.

¹⁹ Cf. the books by Stephen C. Meyer, Michael J. Behe 1996/2006, 2007; Wolf-Ekkehard Lönnig 2005, 2012, 2014, 2015, 2016; Douglas Axe 2017; Tom Bethell 2017; Jonathan Wells 2017, and very many further authors.

²⁰ “realmorphologisch”

²¹ Original German text: “Der Typus ist wie jede Gestalt, realmorphologisch gesehen, Verwirklichung eines Planes in indifferenter Materie, die ebensogut eine andere Gestalt hätte annehmen können. Als ein Universale ist der Typus objektiv gültig, in ihm wird das Wesen der Dinge gefaßt. Naturwissenschaftlich ist die Entstehung der Typen das größte Rätsel wegen ihres inadaptiven Charakters. Daher meinen wir mit W. Troll, daß Typen als »die Gedanken einer aus dem Welthintergrunde in die Natur hereinwirkenden, schöpferischen Macht« aufzufassen sind, welche »der Materie neuartige Ausprägungen verleihend, die typenhaften Grundformen ins Dasein rief.“

George Campbell, 8th Duke of Argyll (1868/1871): *The Reign of Law*, pp. 43-50²²:

“[W]hen we come to the second part of Mr. Darwin's work, viz. the *Homology of the Orchids*, we find that the inquiry divides itself into two separate questions, — first, the question what all these complicated organs are in their primitive relation to each, and, secondly, how these successive modifications have arisen; so as to fit them for new and changing uses. Now, it is very remarkable that of these two questions, that which may be called the most abstract and transcendental — the most nearly related to the Supernatural and Supermaterial — is again precisely the one which Darwin is able to solve most clearly. We have already seen how well he solves the first question — What is the use and intention of these various parts? The next question is, *What are these parts in their primal order and conception?* The answer is, that they are members of a **numerical group**, having a definite and still traceable order of **symmetrical arrangement**. They are expressions of a numerical idea, as so many other things — perhaps as all things — of beauty are. Mr. Darwin gives a diagram, showing the primordial or archetypal arrangement of Threes within Threes, out of which all the strange and marvellous forms of the Orchids have been developed, and to which, by careful counting and dissection, they can still be **ideally** reduced. But when we come to the last question — By what process of natural consequence have these elementary organs of Three within Three been developed into so many various forms of beauty, and made to subserve so many curious and ingenious designs? — *we find nothing but the vaguest and most unsatisfactory conjectures*. Let us take one instance as an example. There is a Madagascar Orchis — the "*Angraecum sesquipedale*" — with an immensely long and deep nectary. How did such an extraordinary organ come to be developed? Mr. Darwin's explanation is this: The pollen of this flower can only be removed by the proboscis of some very large Moth trying to get at the nectar at the bottom of the vessel. The Moths with the longest probosces would do this most effectually; they would be rewarded for their long noses by getting the most nectar [aber in *Dendrobium* ausgetrickst?]; whilst, on the other hand, the flowers with the deepest nectaries would be the best fertilised by the largest Moths preferring them. Consequently, the deepest-nectaried Orchids, and the longest-nosed Moths, would each confer on the other a great advantage in the "battle of life." This would tend to their respective perpetuation, and to the constant lengthening of nectaries and of noses. But the passage is **so curious and characteristic**, that it is well to give Mr. Darwin's own words: -

“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 *Angraecum*, those individual plants of the *Angraecum* 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 the best 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 *Angraecum* and the proboscis of certain Moths**; but the ***Angraecum* 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 obtain the last drop of nectar. . . . We can thus," says Mr. Darwin, **partially understand** how the astonishing length of the nectary may have been acquired by successive modifications.”

It is indeed but a "partial" understanding, ***How came this Orchis to require any exact adjustment between the length of its nectary and the proboscis of an insect?*** This is not a general necessity even among the Orchids. "In the British species, such as *Orchis Pyramidalis*, it is not necessary that any such adjustment should exist, and thus **a number of insects of various sizes are found to carry away the pollinia, and aid in the fertilisation**." This would obviously be the most favourable condition for all Orchids in the battle of life.”

W.-E. L.: This analysis by George Campbell, Duke of Argyll, has been corroborated by recent research. Netz and Renner summarize (2017, p. 474)²³:

“**Long-tongued hawkmoths are polyphagous and take nectar from both long- and short-spurred flowers** (Haber & Frankie, 1989; Agosta & Janzen, 2005; Martins & Johnson 2013; Johnson *et al.*, 2017). On Madagascar, *X. morgani praedicta* also visits the large and wide-open flowers of the baobab species *Adansonia perrieri* (Baum, 1995), and in-flight cages in Madagascar and Erlangen, where Wasserthal (1993) kept a *praedicta* population for several

²² <https://archive.org/details/rei8gnlaw01argygoog>

²³ Netz C and Renner S S (2017): Long-spurred *Angraecum* orchids and long-tongued sphingid moths on Madagascar: a time frame for Darwin's predicted Xanthopan/*Angraecum* coevolution. *Biological Journal of the Linnean Society* **122**: 469–478.

years, the moths, which reach ages of about 6 weeks, *take nectar from many kinds of flowers with different spur lengths* (Wasserthal, 1997)."

Recall, please, also Anna Vlačánková et al. (2017)²⁴, cited in Part I, p. 48:

"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."

As to the Duke's question *per se*: "How came this *Orchis* to require any exact adjustment between the length of its nectary and the proboscis of an insect?" I would like to refer the reader *encore* to Part I, p. 48 (f) on *Arms race and fine-tuned co-evolution*: <http://www.weloennig.de/BeautifulFactsPartI.pdf>

George Campbell continues:

"Does not the hypothesis, then, begin by assuming the very condition of things for which it professes to account? We must start with this Madagascar Orchis *already in possession of a larger nectary than other species*, and with a structure already depending on particular Moths **also already existing**, and already provided with probosces of nicely adjusted length. If the nectaries began first to lengthen, how came the Moths not to leave them for other flowers? And if, on the contrary, they began to shorten, how came they not to be favoured and resorted to by other Moths of a smaller size?

Can we assume that somehow there were **always ready some Moths still larger to favour the longer variety**, and that somehow also there were no smaller Moths to favour the shorter? *Why should the race in this particular species be always in the direction of nectaries getting longer, and not rather in the direction of nectaries getting shorter?** Obviously, **the same hypothesis might be so turned as to account for either result with equal ease**, and therefore it does not account at all for one of those results as against the other. And then there is a larger question than any of these which remains behind. How came Orchids to be dependent at all upon insects for fertilisation?

It cannot be argued that this is a necessity arising mechanically from the nature of things, because, as we are truly told by an eminent naturalist who warmly supports the Darwinian hypothesis, "*exactly the same end is attained in ten thousand other flowers*" **which do not possess the same structure**.' But what is the bearing of this fact upon the theory? Is it not this — that the origin of such curious structures, and complicated relations, **cannot be accounted for on any principle of mere mechanical necessity**? Elementary forces may indeed always be detected, for they are always present. But the manner in which they are worked *irresistibly suggests some directing power, having as one of its aims mere increase and variety in that ocean of enjoyment which constitutes the sum of Organic Life*, some idea of this kind, however unconsciously, however reluctantly conceded, lurks in every form of words in which the facts of science can be generalised to the mind. Thus we find Mr. Wallace himself saying, in the same paper which he regrets the language of Mr. Darwin, that the conception he prefers is, **that the "contrivances" referred to** are some of the results of those general laws which "Creation by Law," p. 474, were so co-ordinated at the first introduction of Life upon the earth, **as to result necessarily in the utmost possible development of varied forms**."

Eliminating the word "necessarily," which, if it has any meaning, does not apply, as we have seen, to the case of the Orchids, this language presents an intelligible idea. It satisfies the mind precisely in proportion as it brings into view, however distant, the attributes of Mind, and gives us a glimpse of "the reason why." The production of variety in beauty and in enjoyment is the purpose which those words suggest. In like proportion is Mr. Darwin's language the truest and the best. His explanations of the mechanical methods by which a wonderful Orchid has come to be are indeed, as he himself says, with great candour, "*partial*" and partial only. How different from the clearness and the certainty with which Mr. Darwin is able to explain to us the use and intention of the various organs! or the primal idea of numerical order and arrangement which governs the whole structure of the flower!

²⁴ Anna Vlačánková, 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>

It is the same through all Nature. Purpose and intention, or ideas of order based on numerical relations, are what meet us at every turn, and are more or less readily recognised by our own intelligence as corresponding to conceptions familiar to our own minds. We know, too, that these purposes and ideas are not our own, but the ideas and purposes of Another - of One whose manifestations are indeed superhuman and supermaterial, but are not "supernatural," in the sense of being strange to Nature, or in violation of it.

The truth is, that there is no such distinction between what we find in Nature, and what we are called upon to believe in Religion, as that which men pretend to draw between the Natural and the Supernatural. It is a distinction purely artificial, arbitrary, unreal. Nature presents to our intelligence, the more clearly the more we search her, the designs, ideas, and intentions of some

“Living Will that shall endure,
When all that seems shall suffer shock.”

*Footnote: “Mr. Wallace sees no difficulty whatever in making any supposition of this kind which the Theory may require. “Now let us start,” he says, “from the time when the nectary was only half its present length, or about six inches, and was *chiefly fertilized by a species of Moth* which appeared at the time of the plants flowering and whose proboscis was of the same length.”” (Italics beginning with “which...” by George Campbell.)

As for testability and falsifiability of the intelligent design theory, see please <http://www.weloennig.de/NeoC.html> and (to be applied on the scientific level for ID) and <http://www.weloennig.de/Popper.html>²⁵. See, moreover, the clear criteria as formulated by Michael Behe (2016) and further authors mentioned in the footnote.²⁶

And a not unimportant Supplement

23/24 August 2018. Some photographs (and a DNA sequence) added until 27 September 2018

Michael Pollan²⁷ comments in *National Geographic*²⁸ as well *The Guardian*²⁹ on some evolutionary problems set up/provoked by the pollination strategies of the orchid family in his edited extracts of his *introduction* to Christian Ziegler’s book on *Deceptive Beauties*³⁰:

“The orchids’ baroque pollination strategies raise challenging questions for the evolutionist, however. Since natural selection seldom rewards unnecessary complication, why haven’t orchids stuck with more straightforward pollination strategies based on nectar reward? And how in the world did their sexual practices become so elaborate? As for the hoodwinked pollinators, what, if anything, do they gain from their relationship with these flowers? If the answer is “nothing but frustration”, then why wouldn’t natural selection eventually weed out insects so foolhardy as to spend their time mating with nature’s version of the inflatable love doll? Many of these deceptions are so specific they fool only a single pollinator and, as for the *Ophrys*, they don’t work all that often. So, what possible advantages could there be in depending so absolutely on a single pollinator, and one you can’t even count on fooling all the time?”

Very precisely/acutely/clearly formulated questions! Yet, instead of doubting the neo-Darwinian gospel, the author provides only several nebulous answers – among them even an outright false one at that.

Pollan also continues to state:

²⁶ Michael Behe (2016): https://evolutionnews.org/2016/10/philosophical_o/

Check also Discovery Institute (2005): <http://www.discovery.org/scripts/viewDB/filesDB-download.php?id=494>; Jonathan Witt (2016) https://evolutionnews.org/2016/11/intelligent_des_31/

²⁷ “Michael Pollan /ˈpɒlən/ is an American author, journalist, activist, and the Lewis K. Chan Arts Lecturer and Professor of Practice of Non-Fiction at Harvard University. Pollan is also professor of journalism at the UC Berkeley Graduate School of Journalism.” https://en.wikipedia.org/wiki/Michael_Pollan

²⁸ Pollan M (2011): Love and Lies – How do you spread your genes when you are stuck in one place? By tricking animals, *including us*, into falling in love. *National Geographic Magazine* 1 September 2009. <https://michaelpollan.com/articles-archive/national-geographic-magazine-love-and-lies/>

²⁹ The weird sex life of orchids (Sun 9 Oct 2011): <https://www.theguardian.com/science/2011/oct/09/orchid-sex-botany-ziegler-pollan>

³⁰ Ziegler C (2011): *Deceptive Beauties. The World of Wild Orchids*. University of Chicago Press. Pollan’s introduction pp. 21-33. “Sex among the orchids”

“The pollination strategy of the *Ophrys* is, like that of so many orchids, ingenious, intricate, wily, and seemingly improbable—so much so that proponents of intelligent design sometimes point to orchids as proof that the hand of a higher intelligence must be at work in nature. (And a rather sadistic intelligence at that.)”

Well, could this reference to “sadism” not rather be an example of an ill-advised anthromorphism distracting the reader from the real issues? Definition in *Merriam-Webster*³¹: “Sadistic”: “Taking pleasure in the infliction of pain, punishment, or humiliation of others.” Or *Dictionary.com*³²: “Deriving pleasure or sexual gratification from extreme cruelty: a sadistic psychopath.” And: *Cambridge Dictionary*³³: “Getting pleasure from being cruel or violent.”

The orchids are doing anything except taking pleasure by the infliction of pain, punishment, or humiliation of their insect pollinators, or deriving sexual gratification from extreme cruelty or violence. (See, please, also the discussion of Jerry Coyne’s comments on *Dendrobium sinense* and “Asyncritus” in Part I, pp. 20-28, especially p. 25 (JC: “No evolving species has to consciously “know” what it has to do to adapt to the environment.”)³⁴:

The plain suggestion given above, quoting Małgorzata Stpiczyńska et al. (2018) on *Epidendrum*, that “the presence of secretory activity in species generally regarded to be rewardless” could probably be generalized to many more food deceptive orchid species has – in principle – also been applied for already decades by neo-Darwinian evolutionists to other plant genera.

For example, Douglas J. Futuyma, referring to perhaps the most important of Darwin’s falsification criteria (“*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*”), asserting (2010, p. 4) that “no one has yet provided the proof that Darwin called for³⁵” or “***no one has ever found a case of a species altruistically serving another, without gain for itself***³⁶” – in contrast to at least 70,000 plant species generating galls. Interestingly, Futuyma later mentions the example of the common dandelion (*Taraxacum officinale*)³⁷:

“Most of the species of dandelions reproduce sexually³⁸, and **have nectar and bright yellow petals that attract insects for cross-pollination**. But the particular species of **dandelion** that grows in everyone’s lawn is an anachronism: it reproduces **entirely asexually**, and it does not need to be pollinated. **Yet it still has nectar and yellow petals to which insects come, though they serve no function**. (Futuyma, 1983, p. 127)”³⁹

Yes, they serve **no function** for the dandelion. Thus, *Taraxacum officinale* plants are serving other species by providing floral scent (to attract them),

³¹ <https://www.merriam-webster.com/dictionary/sadistic>

³² <https://www.dictionary.com/browse/sadistic>

³³ <https://dictionary.cambridge.org/de/worterbuch/learner-englisch/sadistic>

³⁴ <http://www.weloennig.de/BeautifulFactsPartI.pdf>

³⁵ See Part I, p. 16 <http://www.weloennig.de/BeautifulFactsPartI.pdf>

³⁶ Quoted according to ReMine W J (1993, p. 147) of his Volume *The Biotic Message*. St. Paul Science. Saint Paul, Minnesota.

³⁷ “Many *Taraxacum* species produce seeds asexually by apomixis, where the seeds are produced without pollination, resulting in offspring that are genetically identical to the parent plant.” <https://en.wikipedia.org/wiki/Taraxacum>

³⁸ As far as I remember, most *Taraxacum* species reproduce asexually (see reference below).

³⁹ Also quoted according to ReMine.

pollen, and nectar without any gain for themselves. ReMine comments (1993, p. 147):

“Darwin’s challenge seems overturned with this example. Nonetheless, evolutionists answer it by claiming that the dandelion’s nectar and flower were not ‘formed for’ the exclusive good of the insects, these were ‘formed for’ the benefit of the dandelions, who later lost the use for these traits.”⁴⁰

Anyway, the fact remains that the expensive/costly production of bright yellow petals, pollen and sweet nectar not only serves absolutely no positive functions for the dandelions, but also constitutes a definite selective disadvantage (only costs being spent for bees, beetles and birds, no gains) for any of the ~2,000 *Taraxacum* microspecies reproducing asexually⁴¹ – and that for possibly *millions of years*⁴², according to the evolutionary timetable. Similar facts can be mentioned for the genus *Hieracium* (hawkweed), mentioned by Futuyma in a later, the third edition, of his textbook on evolution (see quotation below):

“Hawkweeds, with their **10,000+ recorded species and subspecies**^[7], do their part to make Asteraceae the second largest family of flowers.^[8] Some botanists group all these species or subspecies into approximately 800 accepted species,^[9] while others prefer to accept several thousand species. Since *most hawkweeds reproduce exclusively asexually* by means of seeds that are genetically identical to their mother plant (apomixis or agamospermy), clones or populations that consist of genetically identical plants are formed and some botanists (especially in UK, Scandinavia and Russia) prefer to accept these clones as good species (arguing that it is impossible to know how these clones are interrelated) whereas others (mainly in Central Europe and USA) try to group them into a few hundred more broadly defined species.”⁴³

“The genus *Hieracium* is a very large genus of flowering plants in the sunflower family (Asteraceae). The database IPNI gives more than 12,100 named taxa, including subspecies and synonyms. The following list consists of about 1,000 accepted species and cited synonyms.”⁴⁴

Hence, many botanists count “10,000+ recorded species and subspecies”, most of which reproduce exclusively asexually and many of which produce floral scent, pollen and often also some sweet nectar. To take a closer look at just one example, the orange hawkweed, *Hieracium aurantiacum*:

“Orange hawkweed is mostly apomictic. In New Zealand, most (93.8%) orange hawkweed seed was produced without fertilization [48]. It occasionally produces seed through pollination [12]. Orange hawkweed is pollinated by wind [33] and is visited by insects. On the Upper Peninsula of Michigan, orange hawkweed was an important source of pollen for bees (*Megachile relativa* and *M. inermis*) [86].

⁴⁰ Walter James ReMine continues (p. 148): “Darwin’s challenge does not test evolutionary theory because Darwin himself insisted that natural selection is not the only force acting on organisms.

In spite of Darwin’s claim, a single instance of a structure in one species that serves the exclusive good of another would not annihilate ‘evolutionary theory.’ Even if it could be shown that a structure contributed nothing to the organisms that possessed it, the legitimate conclusion is that natural selection is not the sole directive force in evolution – but Darwin repeatedly claimed that he never thought it was! (Hull, 1989, p 269).

Darwin’s challenge at first sounded like a specific way to test his theory. In the end, the challenge is empty. It does not test his theory, it tests Darwinian ingenuity. Darwin’s challenge merely tests the ability of evolutionists to provide a scenario.”

W.-E. L.: Well, I am not so critical as ReMine regarding this falsification criterium considering the fact that Darwin and his neo-Darwinian followers have assigned natural selection virtually God-like abilities: 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?*” (Darwin). Avise states (1999, p. 83) that “*natural selection comes close to omnipotence*”. And Huxley even asserted that natural selection “*is the only effective agency in evolution*” and the “*sole agency of major evolutionary change*”. Professor Christopher Exley (2009) from Keele University is convinced that “*both the beauty and the brilliance of natural selection are reflected in its omnipotence to explain the myriad observations of life*” (emphasis added). For the references, see, please, Lönnig *Natural Selection*: <http://www.weloennig.de/NaturalSelection.html>

⁴¹ Doll, J and Tower T (2002): “Dandelion is generally an apomictic plant and seed production normally occurs without pollination.” http://128.104.239.6/uw_weeds/extension/articles/dandelion.htm “The genus is taxonomically complex, with some botanists dividing the group into about 34 macrospecies, and about 2000 microspecies, about 235 apomictic and polyploid microspecies have been recorded in Great Britain and Ireland. Some botanists take a much narrower view and only accept a total of about 60 species.” Also, “...dandelions are one of the most vital early spring nectar sources for a wide host [“Bees, Beetles and Birds need them” – The Guardian] of pollinators.” <https://en.wikipedia.org/wiki/Taraxacum> (retrieved 21 August 2018.)

⁴² Oligocene, according to Franz Kirchheimer: “Dieses Fossil ist den Achänen von *Taraxacum* vergleichbar und bezeugt das Vorkommen einer Gattung der Compositen für das ältere Tertiär.“ <https://www.degruyter.com/downloadpdf/j/znb.1948.3.issue-3-4/znb-1948-3-410/znb-1948-3-410.pdf> (retrieved 21 August 2018).

⁴³ <https://en.wikipedia.org/wiki/Hieracium>

⁴⁴ https://en.wikipedia.org/wiki/List_of_Hieracium_species (both retrieved 22 August 2018)

In Maine, orange hawkweed was visited by bumblebees (*Bombus* spp.), though the author noted that orange hawkweed offered minute quantities of nectar [34]. It was visited by nectar-collecting yellowbanded bumble bees (*B. terricola*) in old fields in eastern Ontario [71]. Orange hawkweed was visited by several butterfly species in Michigan [101], and was identified as a nectar species for the Karner blue butterfly in Wisconsin [47].⁴⁵



Left: Flower of *Hieracium aurantiacum* (photo W.-E. L).

Right: Bee on hawkweed (*H. aurantiacum*) – the latter doing everything for their guests (pollen, sweet nectar). However, the apomictic plants are receiving nothing in return. Photograph by Anthony Cooper / Crawley / England

So, has Darwin’s falsification criterium for evolution by natural selection not clearly been fulfilled? Or, how many more examples are necessary to apply it?

For many biologic/scientific reasons, loss of function in the asexually reproducing dandelions and hawkweeds appears to be a legitimate microevolutionary inference. Also, loss of function can likewise happen in almost any other part of a flowering⁴⁶ or other plant species, including, of course, in their nectar producing glands – *as might have occurred in many orchid species* (see above).

Anyway, there is absolutely no “sadism” involved – neither in the would-be pollinators relentlessly exploiting the ‘altruistic’ dandelions for their own purposes exclusively, nor for the insects pollinating non-rewarding orchid species.

Moreover, in the third edition of his widely used volume on *Evolutionary Biology*, Futuyma mentions not only dandelions and hawkweeds, but also *Rubus* and *Crataegus* to include “diverse apomicts” (1998, p. 504):

“Some plant genera, such as *Rubus* (blackberries and raspberries) [>2,000 microspecies], *Crataegus* (hawthorns) [>1,000 microspecies], *Taraxacum* (dandelions), and *Hieracium* (hawkweeds), include not only sexual species, but also diverse apomicts. In the latter two genera, several hundred [in fact, some two thousand/several thousand] apomictic “species”, differing in morphological and ecological features, have been named in Europe. Some sexually sterile hybrids are abundant because they reproduce by apomixes.”⁴⁷

Hence, there are not only just one or two examples – the common dandelion and a hawkweed – fulfilling Darwin’s falsification criterium, but even hundreds

⁴⁵ Encyclopedia of Life: <http://eol.org/pages/843542/details> (retrieved 22 August 2018.) As to the genetics cf. <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-3113.2011.04556.x>

⁴⁶ I myself have worked with four mutation sortiments of flowering plants – altogether thousands of mutants – consisting almost exclusively of loss-of-function mutations in nearly any plant organ imaginable. See publications in <http://www.weloennig.de/literatur1a.html>

⁴⁷ Before these statements, Futuyma explains asexual reproduction as follows (also p. 504): “Asexual reproduction, either by vegetative propagation or by apomixis (parthenogenesis, or development from an unfertilized egg). Asexual lines neither fit nor vitiate the biological species concept, but they may enhance ecological and morphological diversity beyond that achieved by sexual populations.” (Italics by Futuyma.)



Taraxacum officinale (Dandelion). Above: Bee on flower. Below: Mature seeds with parachutes.

“The genus is taxonomically complex, with some botanists dividing the group into about **34 macrospecies, and about 2000 microspecies**” <https://en.wikipedia.org/wiki/Taraxacum>. Photos W.-E. L. In all the apomictic species and microspecies the seeds are formed without sexual reproduction. Thus, no advantage for these plants, but clearly so for the pollinators. See moreover Dandelion flower & clock time-lapse: <https://www.youtube.com/watch?v=kOABCH51KnQ>

if not thousands for just the few plant genera *Rubus*, *Crataegus*, *Taraxacum*, and *Hieracium* referred to by Futuyma (apart from additional “more than 400 plant species known using apomixis as a strategy for their propagation”⁴⁸ and the more than 70,000 gall plants mentioned above).

Now, let’s return to the further text of Michael Pollan (2011). He asserts:

“Yet the peculiarities of orchid sex actually offer one of the great case studies of natural selection, as Charles Darwin himself understood.”

Correct! However, the possibility that the results of this great case study for natural selection could be devastating for the theory, has been carefully circumvented by Darwin and his followers.

Additionally, Pollan states:

“...Darwin was fascinated by orchid pollination strategies, and, though he was puzzled by the purpose of Ophrys orchids' uncanny resemblance to bees (pseudocopulation wasn't observed until 1916), he taught us much of what we know about these plants in *The Various Contrivances by Which Orchids Are Fertilised by Insects*, the volume he published immediately after *The Origin of Species*. Indeed, some scientists believe that had he published his orchid book first, the theory of natural selection might have encountered considerably less scepticism than it did.”

Yes, “he taught us much...” (as even Darwin’s critic, the Duke of Argyll, admitted – see above). However, Pollan’s answer, why “some scientists believe that had he published his orchid book first, the theory of natural selection might have encountered considerably less scepticism than it did” appears to be doubtful, to say the least. This is what Pollan has to say on this question:

“Why? *Because Darwin painstakingly demonstrated how even the most improbable features of these flowers serve a reproductive function.*”

This is exactly what he had liked to do even about “the most improbable features of these flowers”, but was, in fact, totally unable able to realize. Instead, he produced something looking more like an *article of faith* than a scientific demonstration on the absence of functional nectar glands. As has been pointed out repeatedly in Part I on the non-rewarding orchid species: Darwin commented that “*we cannot believe in so gigantic an imposture*”, but this “imposture” has now been established by rigorous empirical research of perhaps thousands of authors during the last more than 150 years beyond any reasonable doubt.

At one point Darwin almost agreed with Conrad Sprengel on the non-rewarding orchids but – being aware that this could essentially jeopardize his entire natural selection theory – he finally disagreed totally.

Michael Pollan goes on to say:

“Many of their structures are so perfectly adapted, both to the plants' requirements and the morphology of their pollinators, that they offered Darwin elegant proofs of his outlandish theory.”

“Elegant proofs of his outlandish theory” by so perfectly adapted structures – “both to the plants’ requirements and the morphology of their pollinators”? (See, please, the many details given especially in Part I.). Pollan later asserts in a

⁴⁸ Brukhin V (2017): Is sex irreplaceable? Towards the molecular regulation of apomixis. “...adventitious embryony was recorded in 148 genera, apospory in 110 genera, and diplospory in 68 genera (Hojsgaard *et al.* 2014). It was shown that apomixis is one of the main reproductive strategies along with the sexual propagation.” [http://ijprb.com/vol12009%20\(2\)/10%20vladimir%20brukhin.pdf](http://ijprb.com/vol12009%20(2)/10%20vladimir%20brukhin.pdf) (retrieved 28 August 2018)

different context (see below): “In evolution there is no plan, of course, only blind chance.”

So according to Pollan and virtually all neo-Darwinians “blind chance” has generated all the perfectly adapted structures in the orchids and their pollinators. For a refutation of this non-scientific assertion I would like to refer the readers to the text above and again to Part I.

Pollan proceeds to explain the putative selective advantage of nectarless orchids as follows:

“...When botanists experimented by adding a nectar reward to a normally nectarless orchid, they found that the pollinators hung around longer, happily visiting other blooms on the same and nearby plants. This does not suit the orchid's interests, however, since inbreeding results in lower-quality seeds.”

That’s really an improbable/peculiar/fantastic/explanation. Two thirds of all the some 30,000 orchid species – hence about 20,000, do, in fact, offer nectar and/or other rewards. Questions:

(1) So, why do they steadfastly/consistently/obstinately continue to produce and offer often copious rewards for their pollinators if “this does not suit the orchid’s interests” because “inbreeding results in lower-quality seeds”?

(2) And what about the rest (consisting of tens of thousands) of flowering plant species being pollinated by bees and other insects and further animals? Have you ever carefully watched different kinds of bees and bumblebees how they fly and hover from flower to often nearby flower – we have even a special term for their behavior: “flower constancy” or “pollinator constancy”⁴⁹ “blütenstet” (well, admittedly some bumble bees do sometimes both, working from flower to flower and then suddenly flying to just another nearby flowering plant species).

(3) So why, if this does not suit the flowering plant’s interests, (since inbreeding results in lower-quality seeds), is there no general tendency to stop/close/impede – or at least to lower – nectar and pollen production and other rewards for their pollinators? Then, of course, the pollinators would also tend to stop reproducing and multiplying – (4) but why, then, is there no natural selection for pollinators visiting only flowers being in a larger distance from one another?

And (5), moreover, as we have documented above and in Part I, the rewardless orchid species generally display lower seed set than the rewarding ones.

Nevertheless, Michael Pollan pursues to argue:

“As with the bee orchid, pollinator frustration works to the advantage of the plant, since the insect is apt to leave quickly and travel further.”

⁴⁹ German: “Blütenstetigkeit”, French: “constance floral ou fidélité floral”, Spanish: “constancia floral, constancia de los polinizadores”.

See for a rational refutation/rebuttal of this improbable assertion the points just presented above. Pollan continues:

“Other studies suggest that a thwarted pollinator will thrust himself more deeply into a flower and thrash about in search of promised food, improving the odds that he'll crash into the pollinia and then leave in a huff.”

And what about the other some 20,000 rewarding orchid species? I think that many readers can follow my assessment, that Pollan's Darwinian explanations consist mainly of just-so-stories and fairy-tales.

However, apart from his assertion that “in evolution there is no plan, only blind chance” (and that we are just animals), I am very fond of Pollan's concluding remarks:

“...Ever since the first human-hybridized orchid bloomed (the earliest in the Western world was recorded in 1856), we humans have become important orchid pollinators too—more intentional perhaps than the orchid bees, but lured into advancing the orchid's interests just the same, assisting in its quest for world domination. Today there are some 100,000 registered hybrid orchids, most of them the offspring of improbable marriages among far-flung plants arranged by, and literally inconceivable without, us.

Not that any of this was ever in the orchid's plan. In evolution there is no plan, of course, only blind chance. But what are the chances that a flower deemed sexy by a handful of witless insects would also be so deemed by us?⁵⁰ The moment that the orchid stumbled upon one of the keys to human desire and used it to unlock our hearts, it conquered a whole new world—our world—and enlisted a vast new crew of credulous animals more than happy to do its bidding. Let's face it: We're all orchid dupes now.

Why the solution proposed for plant galls by Ernst Mayr and Richard Dawkins has failed for the orchids as well

In his book *The Extended Phenotype*, Dawkins (1982, p. 219 and 2016, p. 334⁵¹) refers to Mayr's solution to the problem of galling as follows:

“Mayr (1963, pp. 196-197) discusses the phenomenon of plants making galls to house insects, in terms so favourable to my thesis that I can quote him verbatim almost without comment:

“Why ... should a plant make the gall such a perfect domicile for an insect that is its enemy? Actually we are dealing here with two selection pressures. On the one hand, selection works on a population of gall insects and favors those whose gall-inducing chemicals stimulate the production of galls giving maximum protection to the young larva. This, obviously, is a matter of life or death for the gall insect and thus constitutes a very high selection pressure. The opposing selection pressure on the plant is in most cases quite small because having a few galls will depress viability of the plant host only very slightly. The 'compromise' in this case is all in favor of the gall insect. Too high a density of the gall insect is usually prevented by density-dependent factors not related to the plant host.”⁵²

Dawkins adds:

“Mayr is here invoking the equivalent of the life/dinner principle to explain why the plant does not fight back against the remarkable manipulation by the insect.”

⁵⁰ Sentence in the original introduction.

⁵¹Dawkins, R. *The Extended Phenotype*. The Long Reach of the Genes. Oxford Landmark Science. According to Amazon: 2016-11-1.

⁵² And Dawkins comments (same page): “Mayr is here invoking the equivalent of the life/dinner principle' to explain why the plant does not fight back against the remarkable manipulation by the insect. It is necessary for me to add only this. If Mayr is right that the gall is an adaptation for the benefit of the insect and not the plant, it can have evolved only through the natural selection of genes in the insect gene pool. Logically, we have to regard these as genes with phenotypic expression in plant tissue, in the same sense as some other gene of the insect, say one for eye colour, can be said to have phenotypic expression in insect tissue.”



Above: Complex galls of gall wasp *Pediastris aceris* on *Acer pseudoplatanus*
 Below left: slightly other perspective of the same leaf and galls.
 Right: Some details from the upper side of the leaf. Photos by W.-E. L. 28 May 2018.
 For a discussion of *Plant Galls and Evolution*, see, please
<http://www.weloennig.de/PlantGalls.pdf>

Now, you could basically apply the same line of reasoning of Dawkins and Mayr to the orchids and their pollinators:

“Why [...] should an insect care for the pollination/reproduction/propagation/survival and thus for the continued existence of a deceptive orchid that is its enemy causing the pollinators to suffering fitness costs by that service/procedure? Actually we are dealing here with two selection pressures. On the one hand, selection works on a population of orchid plants and favors those which form flowers, chemicals and pollination devices stimulating the maximum attraction for the pollinators. This, obviously, is a matter of life or death for the orchid plants and thus constitutes a very high selection pressure. The opposing selection pressure on the insects is in most cases quite small because having pollinated a few orchid plants will depress viability of the insect host only very slightly. The 'compromise' in this case is all in favor of the orchid. Too high a density of the orchid plants is usually prevented by density-dependent factors not related to the insect pollinators.”⁵³

And Dawkins could also have added – and wouldn't all this sound *plausible*?:

“Mayr is here invoking the equivalent of the life/dinner principle to explain why the insect does not fight back against the remarkable manipulation by the orchid plant.”

Hence, one could substitute the neo-Darwinian explanation for the origin of the most astonishing and intricate devices produced by the plant galls enabling their insect parasites to grow and flourish (including all the specific abilities of the insect elicitors themselves) – now for the putative evolution of the specific development of the complex orchid structures and their deceived pollinators, – in principle constituting the very opposite in the two systems:

According to the hypothesis, in the first case *the insects dramatically won* the supposed mutation-selection-race and all the *thousands of gall plant species lost it* grandiosely from the Triassic onwards (cf. <http://www.weloennig.de/PlantGalls.pdf>, pp. 59-62), but in the second case – in utmost contrast to first – *the orchid plants splendidly/maginficently/gloriously won that race* thousands of times independently of each other again over millions of years (see Part I) and *all their deceived insect pollinators lost it frustratingly almost totally* to the thousands to this very day.

And there is more: Orchids can also be infected by galls⁵⁴. So, they lost the war against gall insects (and other gallers) but won it against the insect pollinators!

Does it not appear that one can explain everything – even the very opposite of each other – by the neo-Darwinian mechanism – and thus (in the final scientific analysis) hardly anything at all or simply nothing for such concrete questions?

The following comments refuting Dawkins' and Mayr's selectionist explanation of the origin of plant galls (2017, pp. 16-27) can essentially also be applied to deceptive orchid species:

⁵³ And Dawkins comments (same page): “Mayr is here invoking the equivalent of the life/dinner principle' to explain why the plant does not fight back against the remarkable manipulation by the insect. It is necessary for me to add only this. If Mayr is right that the gall is an adaptation for the benefit of the insect and not the plant, it can have evolved only through the natural selection of genes in the insect genepool. Logically, we have to regard these as genes with phenotypic expression in plant tissue, in the same sense as some other gene of the insect, say one for eye colour, can be said to have phenotypic expression in insect tissue.”

⁵⁴ See, for example: <https://www.cambridge.org/core/journals/bulletin-of-entomological-research/article/confirmation-by-dna-analysis-that-contarinia-maculipennis-diptera-ceedomyiidae-is-a-polyphagous-pest-of-orchids-and-other-unrelated-cultivated-plants/5E752DF45BD5921F3B33F3A4732942D> and/or <https://link.springer.com/article/10.1007/s11284-018-1618-9>

No experimental investigation [would have been] suggested by the authors. However, a scientific hypothesis or theory should – in principle – be testable. One may ask a Darwinian how such ideas could be ever proved or disproved: my experience in many discussions over decades so far is that either one does not get any qualified answer or no answer at all. As pointed out by W. R. Thompson in his *Introduction to the Origin*, the main reason appears to be the following:

“The Darwinian doctrine has thus been used, not as a working hypothesis, in the strict sense of the word, but rather as an explanatory principle, which it is sufficient to illustrate by examples, rather than to verify. The role of the Darwinian theory in biology is therefore essentially that of a philosophical doctrine.” – W. R. Thompson.⁵⁵

And, as Tom Bethell reported on an interview with Philipp Johnson (2017, pp. 211/212):

Darwinism “claimed that complex adaptive organs came into existence through the accumulation of micro-mutations by natural selection. And ... it assumed “that stories of adaptive evolution require no confirmation from genetics, or paleontology, or anything else *except the adaptationist community’s prevailing sense of plausibility*.””⁵⁶

Nevertheless, the “adaptationist community’s prevailing sense of plausibility” has often been found to be nothing but subjective story telling and proved to be false for many biological hypotheses. Thus, this plausibility criterion is incomplete, weak and insufficient to establish a solid scientific theory. Much more is necessary for a valid theory – notably falsifiability:

“Statements, hypotheses, or theories have falsifiability or refutability if there is the inherent possibility that they can be proven false. They are falsifiable if it is possible to conceive of an observation or an argument which could negate them. In this sense, *falsify* is synonymous with *nullify*, meaning to invalidate or “show to be false”.

... Scientific theories can always be defended by the addition of *ad hoc* hypotheses. As Popper put it, a *decision* is required on the part of the scientist to accept or reject the statements that go to make up a theory or that might falsify it. At some point, the weight of the *ad hoc* hypotheses and disregarded falsifying observations will become so great that it becomes unreasonable to support the base theory any longer, and a decision will be made to reject it.”⁵⁷

First inference: *The statements of Mayr and Dawkins on the different selection regimes on the origin of plant galls (life dinner race of insect parasites vs. plants) are – in the formulation of the authors – untestable, i. e. neither falsifiable nor verifiable and hence nonscientific.* However, they are just complying very well with the just mentioned subjective and often scientifically baseless “adaptationist community’s prevailing sense of plausibility” – gratuitously presupposing the unproven and unprovable “two great constructors of [macro-] evolution”, random micro-mutations and omnipotent selection for the origin of new complex organs and novel body plans.

For a detailed analysis of Mayr’s line of argumentation: See, please, <http://www.weloennig.de/PlantGalls.pdf> pp.18-27

And a last point: Concerning behavior of the insects on orchid flowers, deviating from normal insect copulation (a possible deviation mentioned in Part I, p. 8), Pollan remarks:

“When it comes to getting an orchid pollinated, sexual deception has an uneven success rate [...], but when it does work, it works like this: The real male bee alights on the beelike

⁵⁵ William RobinThompson (1967): *Introduction to Charles Darwin: The Origin of Species*. Everyman’s Library No. 811, reprint of the sixth edition of 1872.

⁵⁶ Tom Bethell (2017): *Darwin’s House of Cards*. Discovery Institute Press, Seattle.

⁵⁷ <https://en.wikipedia.org/wiki/Falsifiability> Retrieved on 11 August 2017

labellum and attempts to mate, or in the words of one botanical reference, begins “performing movements which look like an *abnormally vigorous and prolonged attempt at copulation*.” In the midst of these fruitless exertions, the bee jostles the orchid’s column (a structure that houses both the male and female sexual organs), and two yellow sacs packed with pollen (called the pollinia) are stuck to his back with a quick-drying gluelike substance. Frustration mounts, until eventually it dawns on the bee that he has been had. He *abruptly flies off*, pollinia firmly attached, in *frantic search* of more authentic female companionship.”

For this, see, perhaps again, Attenborough: <https://www.youtube.com/watch?v=-h8I3cqp gnA> and/or this one: <https://www.youtube.com/watch?v=0nfgibIYbg8>

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. 12⁵⁸). 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).*

Back to Part I: *cf.* <http://www.weloennig.de/BeautifulFactsPartI.pdf>

As a little reminder: Some further photographs by W.-E. L. of orchid genera already depicted in Part I and several new x *Cambria* hybrids and others and near the end of the article also some additional photos of *Taraxacum*



Phalaenopsis hybrid with variegated flowers
(pollination by deceit)

⁵⁸ Bronstein J L (Editor) (2015): Mutualism. Oxford University Press, Oxford.



Above: *Phalaenopsis*, same inflorescence (somewhat enlarged), backlit photograph.
Below left. Habitus of the plant. Right: Vegetative part including roots.



Above: *Paphiopedilum* hybrid⁵⁹. Below left: *Vanda coerulea* hybrid. Right: *Brassia* (all: pollination by deceit)

⁵⁹ Robert W. Pemberton (2013, p. 66): “Despite their wide geographical distribution, diverse habitats, and sizes, all species have the same basic floral morphology and pollination mechanism (Cribb 1987, 1997b; Bernhardt and Edens-Meier 2010; Edens-Meier et al., in press). Species are self-compatible but require insects to transfer pollen from the anther to the stigma (Edens-Meier et al. 2011). None of their flowers is known to produce nectar or other rewards for pollinators and so are pollinated by deceit (Nilsson 1979; Edens-Meier et al., in press).”

See: [http://lankesteriana.org/Lankesteriana/Vol.%2013/Lankesteriana%2013\(12\)%202013/13_Pemberton_pollination_of_slipper_orchids.pdf](http://lankesteriana.org/Lankesteriana/Vol.%2013/Lankesteriana%2013(12)%202013/13_Pemberton_pollination_of_slipper_orchids.pdf)



One of the x *Cambria*⁶⁰ hybrid orchids (however, without providing the exact species names involved in its generation by the garden centre selling it).

⁶⁰ “ × *Cambria* is a commercial name for intergeneric hybrids among the following genera of orchids, belonging to the Orchidaceae family, Epidendroideae subfamily, Cymbidieae tribe, Oncidiinae subtribe: *Odontoglossum*, Kunth 1816; *Oncidium*, Sw.; *Miltonia*, Lindl. 1837; *Cochlioda*, Lindl. 1853; *Brassia*, R. Br. 1813.” https://en.wikipedia.org/wiki/%C3%97_Cambria



Further captivating forms and colours of x *Cambria* hybrid orchids



And further impressive orchid flowers of the non-specified x *Cambria* hybrid orchids
Just to show us some further examples of the many forms and colours



Same as on the previous page: somewhat further enlarged



To repeat professor Michael Pollan's most original comment in this connection (2011): "Ever since the first human-hybridized orchid bloomed (the earliest in the Western world was recorded in 1856), we humans have become important orchid pollinators too — more intentional perhaps than the orchid bees, but lured into advancing the orchid's interests just the same, assisting in its quest for world domination. Today there are **some 100,000 registered hybrid orchids**, most of them the offspring of improbable marriages among far-flung plants arranged by, and literally inconceivable without, us."



Further forms and colours of x *Cambria* orchid hybrids (below *Oncidium* being involved).
See additional example next page



Brassia seems to be involved here



Further *Phalaenopsis* hybrids



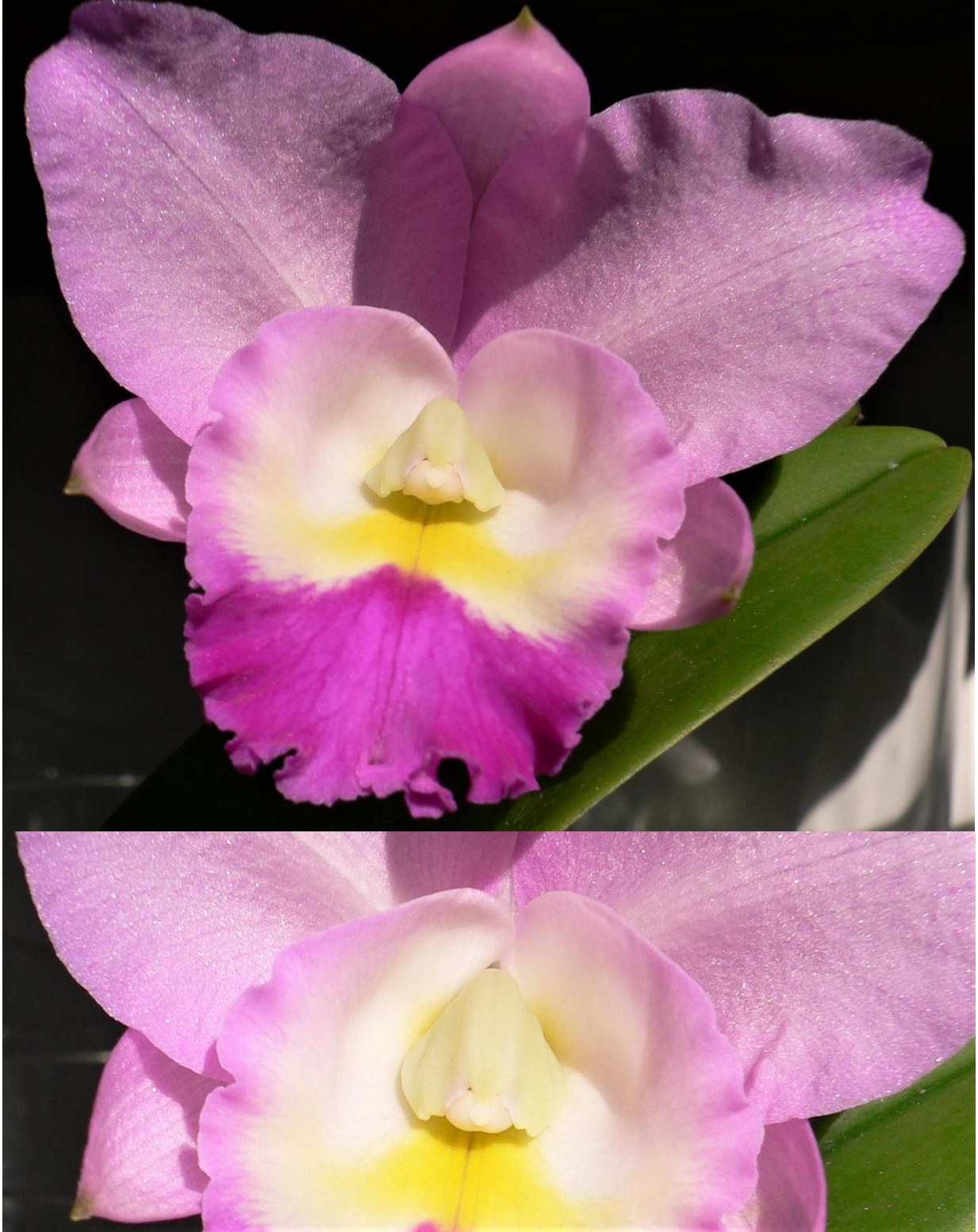
Phalaenopsis inflorescence



Oncidium hybrid (above: inflorescence; below: flower enlarged)



Probably also *Brassia* hybrid



Cattleya hybrid (almost always without reward, thus pollinated by deceit)
Photographs again by W.-E. L.



Dendrobium hybrid – Flowers almost entirely white



Flower and inner part of nearly white flowering *Dendrobium* hybrid enlarged



Above: Another *Dendrobium* hybrid. Below *Miltonia* hybrid



Another *Phalaenopsis* hybrid



And a further *Phalaenopsis* hybrid (all orchid photos above again by W.-E. L.)

Just to take a look at **natural** hybridization in South Africa and elsewhere. S. D. Johnson reports (2018):

“There are 0.082 reported natural hybrids for every orchid species in South Africa, which is similar to the value of 0.09 reported for angiosperms in general. The largest number of putative natural hybrids is found in *Disa* (17 hybrid combinations involving 25 species) and *Satyrium* (11 hybrid combinations involving 13 species). The weighted average hybridization propensity (percentage of possible hybrid combinations realized) for **South African orchids is estimated to be 0.92%**, which is **much lower than the value of 6% reported for orchids in seven other mainly temperate northern hemisphere floras**. Natural hybridization appears to be more frequent in the Cape Floristic Region (documented for 15% of orchid species) than in the rest of South Africa (documented for 8% of orchid species).”⁶¹

In contrast to about 10,000 non-rewarding orchid species, there are thousands of apomictic species and microspecies in other plant genera (see text above), which do everything for their pollinators (mostly pollen and nectar for bees, beetles, birds and flies) but to no avail for themselves: see again a bee on the composite dandelion flower and also a fly on and in such a flower on the next page:

⁶¹ Johnson S D (2018): Natural hybridization in the orchid flora of South Africa: Comparisons among genera and floristic regions. South African Journal of Botany: <https://app.dimensions.ai/details/publication/pub.1100795320>



Above: Bee on dandelion composite flower.
Below: Fly *on* and *in one and the same* dandelion flower.
Photographs by W.-E. L. 30 August 2018.



Above: Mature seeds with parachutes of dandelion (*Taraxacum officinale*).
Below: Meadow with many ripe dandelions. Photos W.-E. L.

DNA Sequences of the dominant *DIP* gene (involved in apomixis of dandelion, *Taraxacum officinale*) in comparison to the recessive *dip* gene (necessary for sexual reproduction) according to Peter Johannes VAN DIJK, Diana RIGOLA, Marinus Willem PRINS, Adrianus Johannes VAN TUNEN (2018): <http://www.freepatentsonline.com/20180216122.pdf>⁶²

The dominant *DIP* gene displays three larger deletions and what appears to be two insertions (see the bases marked below). Further research might show whether the differences are due to purely random or possibly partially programmed mutations resulting in apomixis in *Taraxacum officinale*.

It seems that special plant groups/families display much high percentages of species reproducing apomictically than many others and of the more than 14,000 angiosperm genera (<http://www.theplantlist.org/browse/A/>) about 326 (so far counted)⁶³ show different kinds of apomixis, so most of the others don't. For the possibility of partially programmed mutations, see, please, <http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf> pp. 189/190.

DIP 1	GAAACCGAAGCAAACCTCTACCACATCCGCCTCCGGGTCCGCCTCCC GAG ACCGCTAACCC
dip 1	GAAACCGAAGCAAACCTCTACCACATCCGCCTCCGGGTCCGCCTCCCAAGACCGCTAACCC
DIP 61	CCAACCAC CAC CCGTTAAACCCCTACTCGTGGGACCAAGCAGTCGGCCTCTCCGTCTCA
dip 61	CCAACCAC --- CCGTTAAACCCCTACTCGTGGGACCAAGCAGTCGGCCTCTCCGTCTCA
DIP 121	CCA ATACCA ATTCCAATTCCGATTCCGACCTCAAAGACGAAACCCTCGTCTCTCCAAAT
dip 118	CCA ----- ATTCCAATTCCGATTCCGACCTCAAAGACGAAACCCTCGTCTCTCCAAAT
DIP 181	CCCTCAAACAAAAGGGCAAATTCGTATTATCACCCAACGGTTACTCCTCATTGTTACCT
dip 172	CCCTCAAACAAAAGGGCAAATTCGTATTATCACCCAACGGTTACTCCTCATTGTTACCT
DIP 241	CCTCGAGCCTAACGAATTTAGGTCAACCC A ATTTCAAAGGCGTCCCTGCGGACCCCGATT
dip 232	CCTCGAGCCTAACGAATTTAGGTCAACCC G ATTTCAAAGGCGTCCCTGCGGACCCCGATT
DIP 301	GGGTGGTTGAAGCCGAGATAACGTTGGATAGTGTGATACACGTGGATGTTGATGGAGAGG
dip 292	GGGTGGTTGAAGCCGAGATAACGTTGGATAGTGTGATACACGTGGATGTTGATGGAGAGG
DIP 361	TGGTGCATATTGTCGGGAGTAGTCTGATGTGGTGGTTAGACAGAATGTTGGT -----
dip 352	TGGTGCATATTGTCGGGAGTAGTCTGATGTGGTGGTTAGACAGAATGTTGGT GGTG?TG
DIP 414	----- GGGAAGCAGCGGTGGTATAAT ----- CCGTTGCCGCTGTTTCAGACGA
dip 412	GT?G?T?? GGGAAGCAGCGGTGGTATAAT CC?CCGACC CCGTTGCCGCTGTTTCAGACGA
DIP 457	ATTTGGAGTGTTTAGGGAAGGAGGAGGCGGGGAGTTGTTGAAGGTGTTGTTGGTGACGA
dip 472	ATTTGGAGTGTTTAGGGAAGGAGGAGGCGGGGAGTTGTTGAAGGTGTTGTTGGTGACGA
DIP 517	TTGAGAGAGGGAAGGAGAGAGGGTGGGGCCGGGGTGTGTGTACCCTCTGCATCAGAGTA
dip 532	TTGAGAGAGGGAAGGAGAGAGGGTGGGGCCGGGGTGTGTGTACCCTCTGCATCAGAGTA
DIP 577	ATGTTAGGTGATGTATATTTTTTTT CT ACATATAAAG-TTACTATAGGAGAAAAAGGACT
dip 592	ATGTTAGGTGATGTATATTTTTTTT G TACATATAAAG T TTACTATAGGAGAAAAAGGACT
DIP 636	GGATATTATATTATACATACCTG-AAACAAGGAAACGTTTTCTTTCAAATTTTGGCTGT
dip 652	GGATATTATATTATACATACCTG A AAACAAGGAAACGTTTTCTTTCAAATTTTGGCTGT
DIP 695	ATTATTATTTTGTGACCATGTTGGGCTAAAATGGCCAATTATTTACTTATGACATGGTT
dip 712	ATTATTATTTTGTGACCATGTTGGGCTAAAATGGCCAATTATTTACTTATGACATGGTT
DIP 755	AAAAAATATTGGTGTCTTGTGTTTTGTATAATTACAATTTATATT ----- AGTATCG-
dip 772	AAAAAATATTGGTGTCTTGTGTTTTGTATAATTACAATTTATATT ???????? ACTATAAC
DIP 805	--ATGCAATGTAAGATTGTAGAAAGCGCTACCGTATAAAACAACATAAGTCATGAGGTTA
dip 832	TTATGCAATGTAAGATTGT GTATAAAACAACATAAGTCATGAGGTTAACCC CTAGTGGGA
DIP 863	CACCC TAGTGGGTCAAGGGA CAAAAACATTTTAAACGTTTTTCAG (909 bp)
dip 879	TCAAGGGGCTACACCCC GGAACAAAACATTTTAAACGTTTTTCAG (926 bp)

⁶² We, that is my friend Roland Slowik (Dietzenbach), who rewrote the sequences, and I, could not identify several of the bases due to low resolution (coarse pixelation) in the original patent application.

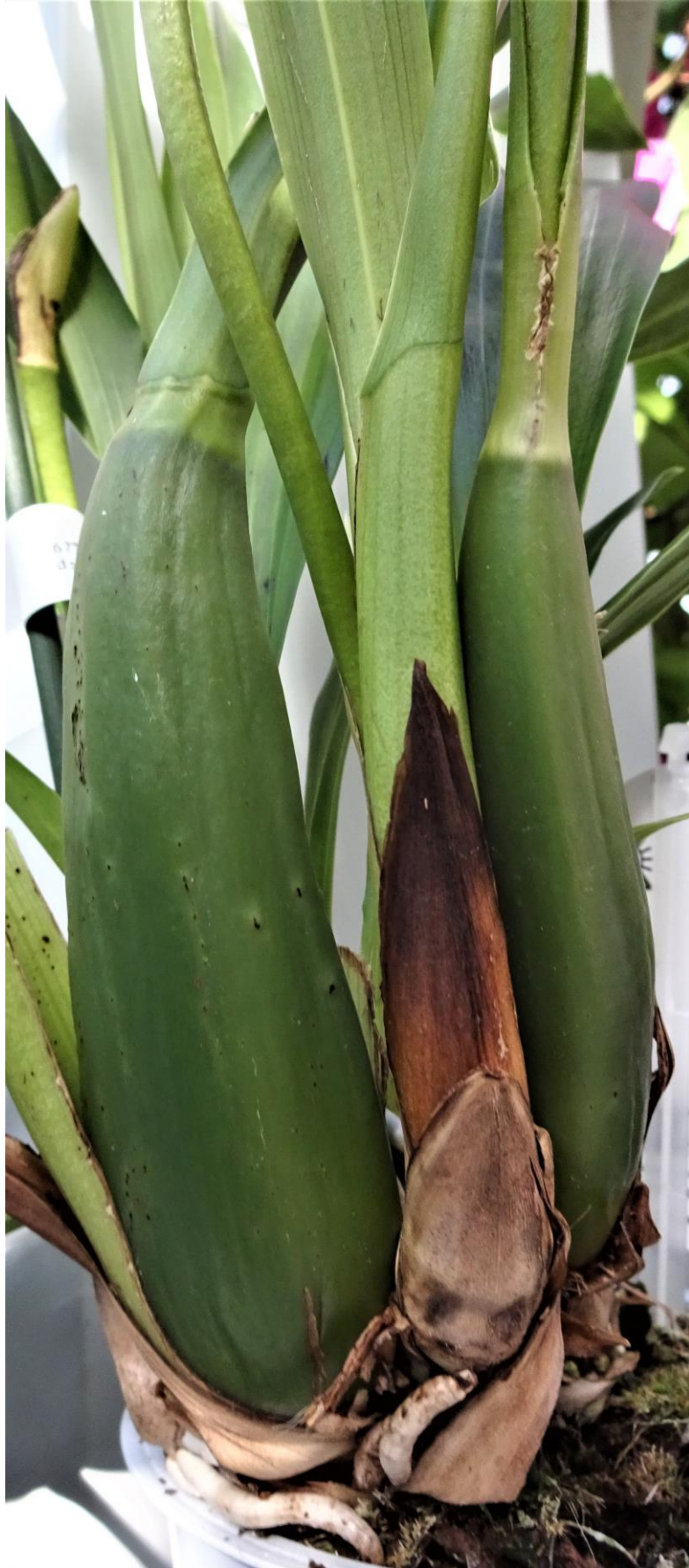
⁶³ Vladimir Brukhin (2017) speaks of altogether "more than 400 plant species known to use apomixis as a strategy for their propagation." See details in [http://ijprb.com/vol%2009%20\(2\)/10%20vladimir%20brukhin.pdf](http://ijprb.com/vol%2009%20(2)/10%20vladimir%20brukhin.pdf). It remains, nevertheless, a minority.



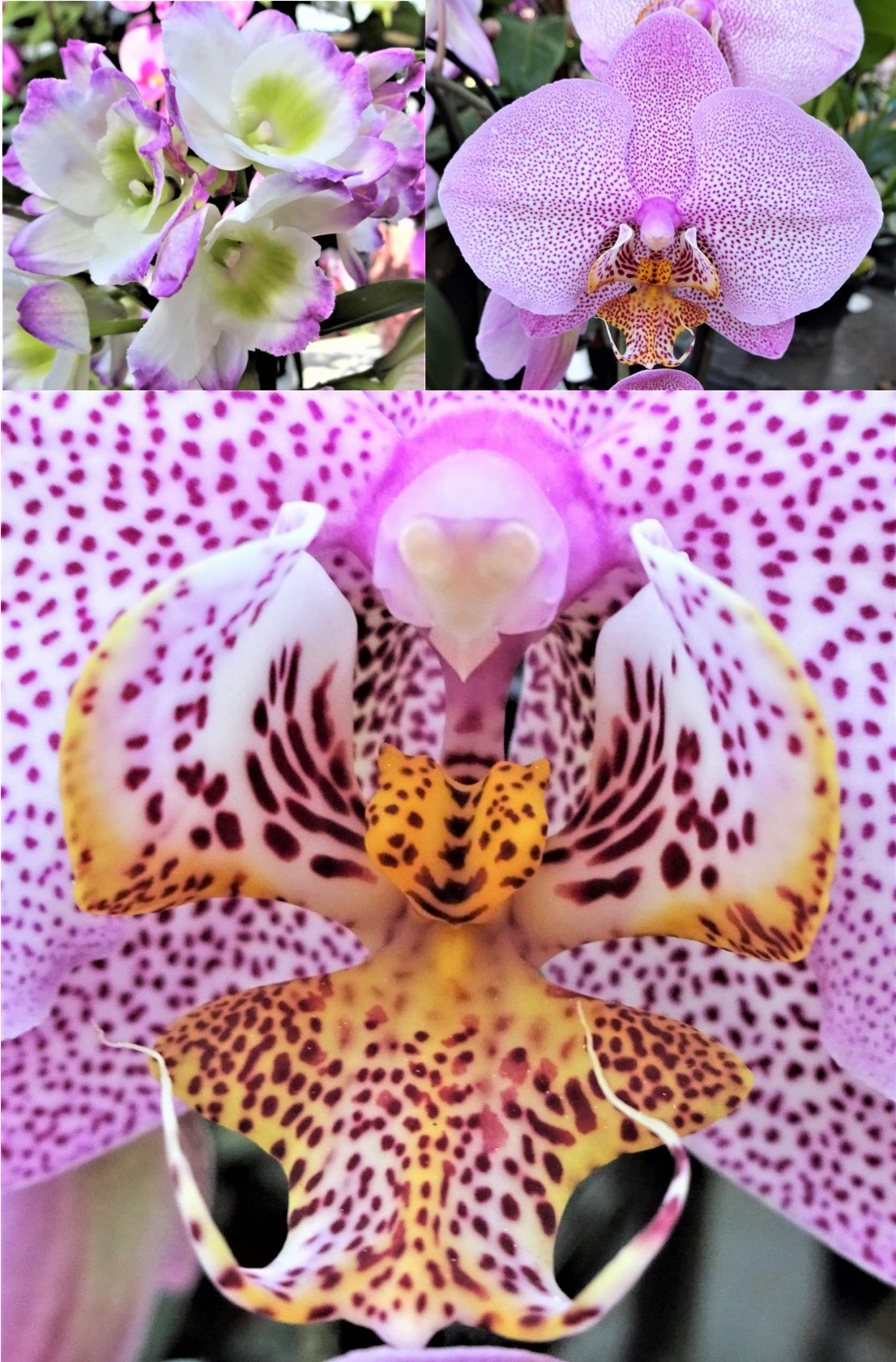
Above: Mature seeds with parachutes on head of *Taraxacum officinale* (Dandelion)
Below left: Flower of of *Psychopsis* (Orchid). Right: middle part enlarged.
Photographs: W.-E. L.



Zygopetalum hybrid



Lower vegetative part of *Zygopetalum* hybrid



Above left: *Dendrobium* hybrid. Right: Flower of another *Phalaenopsis* hybrid.
Below: Middle part of *Phalaenopsis* flower magnified (photos W.-E. L.)



Inflorescence of *Encyclia chacoensis* (photograph W.-E. L.)



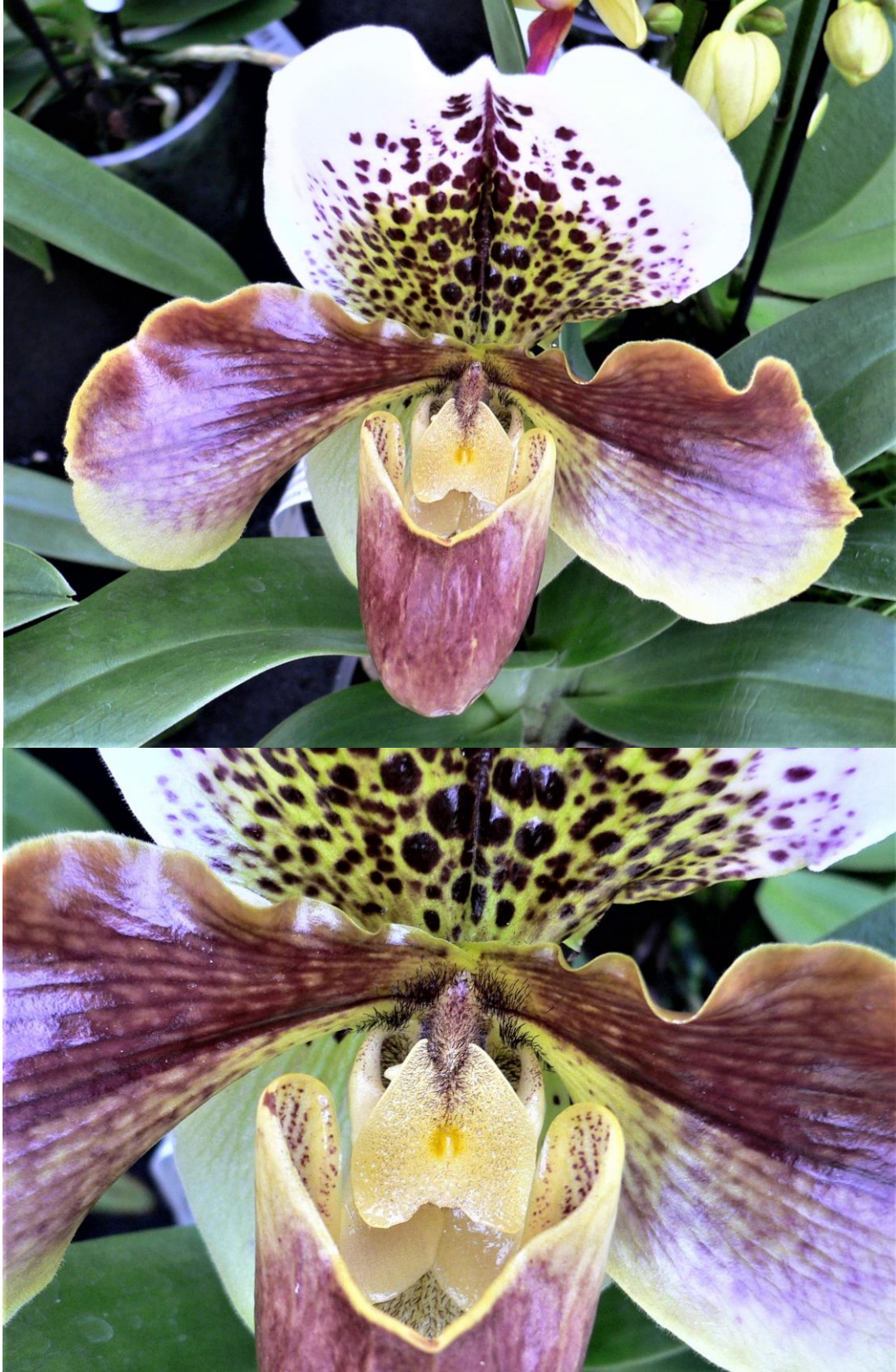
Probably Colmanara Wildcat 'White Lip', an intergeneric hybrid between *Odontoglossum*, *Miltonia* and *Oncidium*.

Left: Inflorescence.

Right: Lower vegetative part of that hybrid enlarged.



Above: Single flower of hybrid shown on previous page. Below: middle part enlarged.



Above: flower of *Paphiopedilum* hybrid. Below: Middle part enlarged
Photographs W.-E. L. 30 August 2018

Back to Part I: cf. <http://www.weloennig.de/BeautifulFactsPartI.pdf>
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