Pas ng n a quire m Prop ies o grou d?

An attempt at epigenetics

from Renatus Derbidge

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In a project with *Senecio vulgaris* (common groundsel) is being investigated at the research institute at the Goetheanum to determine whether plants are capable of are to internalize reactions to environments and the acquired skills the next generation to inherit.

In his latest publication quotes the neurobiologist and Science journalist Peter SPORK (2009) the German one Pioneer of genetics and Stem cell research Rudolf Jeanisch: “The decade of Genetics are long gone. This is where we are now in the middle of the decade of epi-genetics. The most important things are currently happening in this field and most exciting things Molecular Biology.” SPORK reports about the big one upswing of a long time little respected discipline within genetics, the Epigenetics. So the “up there”, “over” or “around” Genetics. In the book title is referred to as the “second code”. She describes everything those phenomena of heredity and gene regulation, who cannot survive alone the genetic code, the Have DNA explained. SPORK uses a comparison: The genes can be viewed as the hardware of a computer. you decide the basic nature and set boundaries. Within but this can use the software, i.e. the epigenome, with great variability in its use or non-use

the genes control and influence. The better the software, the more optimal it will be the hardware used.

This is where the revolutionary lies on the new research results in epigenetics. Environment not only changes, as previously postulated, for example through harmful ones UV radiation affects the DNA (mutations) but takes in much greater influence on the genome, or rather the epigenome and thus on the characteristic expression of the entire organism (see WIRZ 2008). Through this These research results acquire explosive social relevance. Each

Environment, upbringing, lifestyle, nutrition influence the genetic material and with it that lives of descendants.

Because the epigenome is inherited. If I smoke, I change the micro-structure that is on my body DNA is located, that structure, which is inherited with the genome will: So I do no harm just me, but also my descendants and even affects the life expectancy of my grandchildren.

No insurance company will ignore these research results for a long time.

Epigenetics explains why For example, identical twins become increasingly different despite having identical genetic material, why the disposition cancer is so different from person to person and why Despite humans and chimpanzees almost identical genome but are so different.

Since CRICK formulated the central dogma of genetics in 1958, it has been in effect for a long time the “one gene, one phenomenon” dogma (HOLDREGE 1999, p. 72). It says that there is a kind of one-way street from the gene to the Protein and ultimately up to to the corresponding feature. This view of the “Autocracy” of genes determines the direction of view many geneticists still do today. This is where the world view comes from: “The genes determine the phenotype, the appearance”, with consequences what “bad” genes are like immutable and set insurmountable boundaries.

A stupid boy remains stupid - it's the genes' fault. This one-sided view

Short and sweet:

As the author explains, epigenetics revolutionizes the image of inheritance process.

Whether acquired characteristics are passed on genetically should be examined in an experiment with groundsel.

To do this, the plants are exposed to dark or drought stress and Tested for differences in the 7th generation in 2010.

starts to leave today.
The “software” reacts to
the environment and can from
Living beings actively changed
become. Epigenetics provides that
biological foundation for
the statement: “I am mine
blacksmith of your own life –
and that of my descendants
in addition".

Even the diet of the
pregnant woman affected
the properties of the embryo.
It was found in mice that
females...
They were fed food enriched
with vitamins and nutritional
supplements and were slim
and healthy
gave birth to boys with brown
fur. Without these additives
The young ones were in the food
Mice became fat, susceptible
to illness and had yellowish fur
(JIRTLE 2007). A
another known case of
epigenetic inheritance
are the so-called Dutch “hunger
children”, whose mothers lived
in the winter of war
were pregnant in 1944/45.
The malnutrition of the
mother and subsequently also
of the embryo, especially in
the early embryonic period,
is still evident 60 years later in
both the phenotype and
also in genotype. In particular,
the “insulin-like growth factor 2”
gene (IGF2),
which is an important one
Growth factor encoded
those affected receive a lower
number of chemical substances
Changes on than at
her siblings who came before
or were born after them (www.n-
tv.de). So-called methyl
groups are
incorporated into the DNA
to regulate its activity.
Few methyl groups mean
high, lots of them
appendages a diminished
Activity of the gene – up to
for complete elimination
the same.

Hundreds of such influences
of the environment on gene
activity are already known
and well studied. With this new
biological knowledge, the role
of the cell is changing
and the entire organism
in gene regulation, or
in more general terms,
the development and metabolic
processes, again
into view.

epigenetics and breeding

Epigenetics is important for
animal and plant breeding
Core topic. Every farmer knows
these phenomena. “Farm
breeds” and “farm varieties” are
Result of this now known
type of inheritance. The
Farm (environment) is doing well
in the living being
internalized and revealed
more and more in the future.
Related
With feeding, Rudolf STEINER
(1924) speaks of the inheritance
of “cosmic forces”
– these are also internalizations
of environments
are epigenetically fixed and
inherited. Every farm needs
as an independent organism
or “individuality”
own farm breeds – at the
animals as well as plants.
Expressed himself explicitly
Steiner on inheritance in
Essay “Haeckel and his
Opponent” (STEINER 1900), where
him as an essential element
Inheritance emphasizes the
“passing on of acquired
characteristics”, i.e
Ability to react to
to internalize environments
and to the following generation

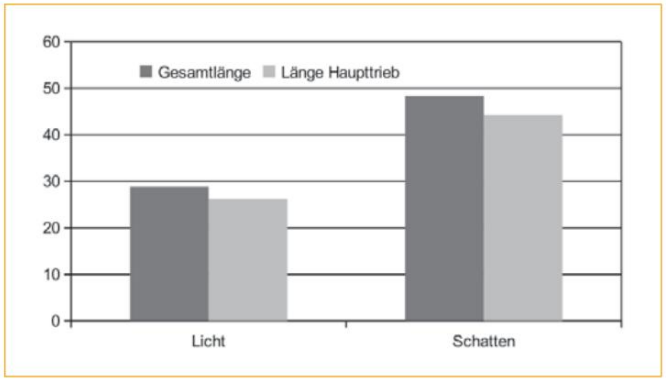
Fig. 1: Light (L) and
Shade plants (S), at the same time
Time sown and pricked

Fig. 4: Dry (T) and
Wet plants (F), at the same time
sown and pricked

to pass on the function. Work
like that of Tanja BAUM-
GARTNER (2007), the shape
changes of plants
described through eurythmic
sound gestures, or
by Ute KIRCHGÄSSER (2006),
those with tone intervals in
Plants changed in breeding
experiments cannot be
understood without epigenetics.

Senecio vulgaris – our test plant

If you want, like in Senecio,
Project of the research institute
at the Goetheanum
the leadership of Johannes
We're currently trying
is used to demonstrate
epigenetic inheritance



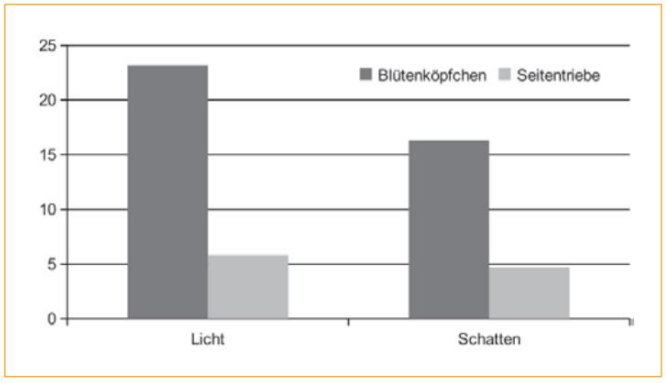


Fig. 2: Comparison of the Length ratios for light and Shade plants

Fig. 3: Comparison of the number of flowers and side shoots in light and Shade plants

best organisms with a number of special features: Short Generation time, easily recognizable characteristics, genetic Uniformity. *Senecio vulgaris* largely meets these requirements was in the research institute intensively investigated at the Goetheanum (BOCKEMÜHL 1972, 1980, HOLDREGE 1986). The Plant has expressive leaf metamorphosis and a variable shape. Reactions to differences in the growth conditions are reflected in the leaf metamorphosis very finely, but clearly reflected. In addition, the common groundsel has a relatively short development time of two to three months from sowing to seed maturity achieved even in winter becomes. In a year you can Therefore, a good three to four generations can be recreated.

And finally multiplied *Senecio vulgaris* is strict self-pollinating or even without pollination *(apomic-table).* Any mother plant brings genetically identical ones Daughter plants highlight changes in developmental dynamics, plant shape and leaf metamorphosis easy to observe. We do this feature use us to internalize skills when dealing with specific to investigate environments.

Experimental setup

The first or the F1 generation: From a mother plant starting from the test, daughter plants grow underneath different conditions (environments), which represent extreme locations which the plants still have Seeds reach maturity. The Environments are static Water and drought, and plus both reinforced by additional salt stress, all-day sun exposure and perfect shade.

For comparison, one is used Control group conducted without the influence of stress. After The seeds will bloom of the plants harvested.

The F2 and further generations: The descendants of the plants from the seven different locations grow again under the appropriate environmental conditions. This is how a line becomes exposed to a certain environment for a total of six generations in a row.

The test in Neutral cultivation

The decisive moment of the experiment is the replica the seventh generation of everyone Variants, now under the same environmental conditions. This will show whether the Plants show a kind of “memory” of the previous growth conditions of their ancestors. We expect, that the lines even though they Now everyone grows under the same conditions, in their own way Shape still shows the typical morphology of the mother plant. After classical theory is not “Memory” in the phenotype to be expected, because the DNA is determined by the locations (even after six generations). Epi-genetics would be able to explain a changed phenotype.

If initial tests prove which this year after the 3rd generation carried out are, as promising, The experiment is expanded with *Arabi-dopsis thaliana,* the thale cress. This The “favorite plant” of geneticists is molecular right down to the examined in detail. Allow changes to occur at the genome level This makes it relatively easy notice. Can also the Arabidopsis plants phenotypic characteristics would like to be documented we work in cooperation with a research institute appropriate infrastructure molecular studies carry out. Down to the cellular and genome level so “memory” phenomena to be viewed as.

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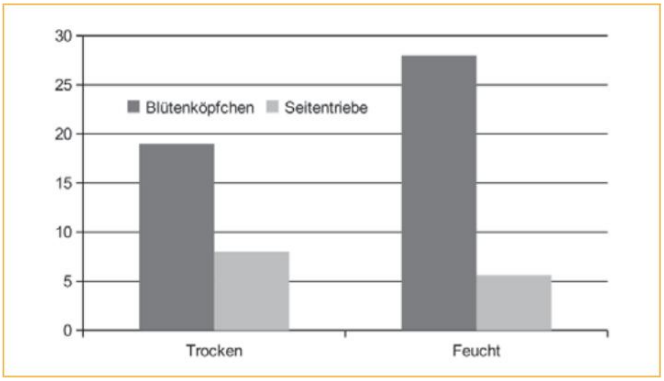
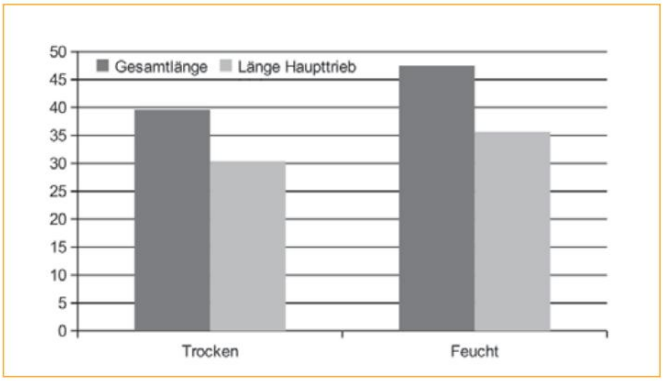
Results of the Gestalt observations the location lines

Let's use two examples morphological differences the variants clarified become. If you compare light and shade plants the extreme differences obviously (see photo, Fig. 1). The squat, strong light plants small, bushy and bear lots of flowers. On the other hand, those Shade plants work limp, with thin, fragile leaves. The Vegetative dominated, flowers only a few are scheduled. The graphic representation shows the differences in characteristics particularly clearly (see Figures 2 and 3).

The difference between the plants “Dry” (T) and “Damp” (F) is on the not so big at first glance (see photo, Fig. 4). The Graphics (Fig. 5 and 6) clarify what is happening first is noticeable at second glance. Moisture promotes the vegetative and inhibits it Flowering impulse, like the big one Number of long, skinny ones shows side shoots. Drought causes side shoot development to slow down and induces early flowering with Relatively more flowers (in Fig. 4 of the dry plants (T) are the “dandelions” that have already bloomed Flower heads can be seen at the wet plants (F) the flowers aren't there yet once opened).

In addition to the pressed leaf rows of variants, there are a series of shape characteristics that can be quantified. Figure 7 presents some of these characteristics All seven lines differ significantly in the characteristics examined. First results are expected in late summer 2010.





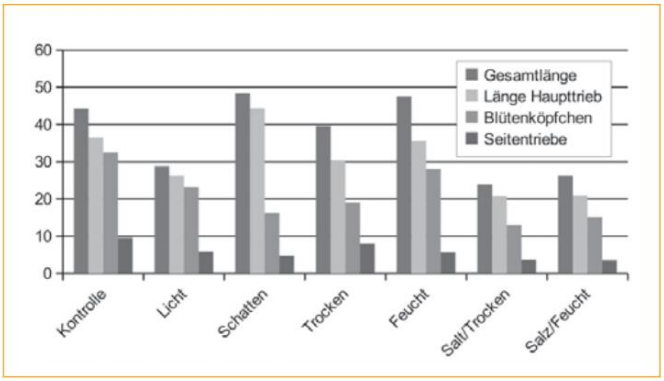


Fig. 5: Comparison of the Length ratios of dry and wet plants

Fig. 6: Comparison of the number of flowers and side shoots of dry and Wet plants

Fig.7: Differences in shape Location variants