“Hard core” and auxiliary hypotheses of research programmes in creation research

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1 Problem formulation and objective

Creation research, which is based on the biblical narrative, is often rejected as not being scientific. It is claimed that its results are already roughly determined from the outset – namely what is written in the Bible. The foundations of theory formation derived from the Bible are not put up for discussion in principle. One says creation research is therefore dogmatic and not interested in gaining knowledge in an unbiased way (if at all). Failure on the basis of data is ruled out from the outset; empirical evidence must take a back seat in the event of a contradiction with the precepts of faith, thereby reducing science to absurdity.

But what is "scientific" and how does science work in practice? In any case, the history of the natural sciences shows that the conflict between theories and data is very often (if not regularly) resolved not in favour of the data, often over a long period of time. In other words, although contradictory data are recognised as anomalies that call the theory in hand into question, they are not given the weight to overturn that theory. Furthermore, the history of science shows that it was often a good strategy not to abandon theories prematurely due to anomalies; time and again, anomalies could be transformed into supporting data by improving the theories.

The extent to which the above criticisms of creation research also apply to approaches in evolutionary research will not be examined in detail here. However, it should be pointed out that hardly any evolutionary theorist is open to the idea that the "fact" of several billion years of organic evolution is open to question. In fact, this is often taken as a kind of dogma. In evolutionary research, contradictory data in no way leads to a questioning of the general macro-evolution of living organisms (for the term "macroevolution", see Junker & Scherer 2013, Chapter II.4). Rather, partial theories within the framework of the evolutionary paradigm are adapted accordingly (cf. Junker 2021; how successful this is must be discussed on a case-by-case basis and is also not the subject of this article) without questioning the fundamental paradigm. This remains untouched as the hard core. The question of under what circumstances evolution as an interpretative framework would be challenged is not easy to answer and is rarely asked.

Firstly, it should be noted that it is not unusual in the scientific community – it is rather the rule – that a hard core of theories is protected from refutation. If you like, science is always dogmatic to a certain extent or is based on conventions that are not empirically founded, but can be attributed to the preferences, habits or conventions of the scientists involved.

The Hungarian philosopher of science Imre Lakatos has described this situation in his concept of research programmes. In research programmes, he distinguishes between the "hard core" of some fundamental content of theories, which are protected from refutation (he shows from the history of science that this protection is done for good reasons), and a mantle of auxiliary hypotheses, which are modified on the basis of new findings in order to protect the hard core. However, the protective mantle should be revised in such a way that it enables an increase in knowledge, i.e. it should be possible to predict new findings, and these should also be able to be confirmed, at least in part.

Let us return to creation research. The fact that it is based on dogmatic propositions is nothing unusual in science. It is not possible to twist a "scientific-theoretical rope" out of it. Whether creation research can be fruitful science, i.e. lead to an increase in knowledge, depends on other things.

This brings us to the objective of this article. Using the example of basic type biology, we will analyse

- whether creation-theoretical research programmes in the sense of Lakatos exist and can be described as "scientific",
- whether creation theory research programmes can be regarded as powerful competitors to evolutionary research programmes and
- whether Lakatos' research programme concept is a suitable scientific-theoretical design for creation research or whether creation research needs its own theory of science. Can creation research adopt something – possibly modified – from what is "on the market"?

2 Lakatos' research programme concept: science as a competition between research programmes

2.1 Introduction

In this chapter, I mainly use the work of Lakatos (1974) (abbreviated to "L"), and Chalmers (1994) as a supplement.

In order to understand the motivation for Lakatos' research programme concept, a brief excursion to some stages in the more recent history of the philosophy of science is helpful. The guiding question can be formulated as follows: Is there an irrefutable basis for certain knowledge?

2.1.1 Logical empiricism

According to the justification thinking of the logical empiricism or logical positivism, science consists of proven statements. Knowledge is equated with proven knowledge. Scientificity means "based on empirical observations". These are recorded in so-called protocol statements (formulations of observation statements). Based on these, general propositions are to be formulated by induction.

However, no proof can be provided in this way because far too many cases have to be checked, which is impossible (induction problem). If conclusions are drawn from individual observations to the totality, the laws derived from them exceed our experience. Furthermore, for practical reasons it is not possible to survey or analyse all the cases that occur. Statements of probability are also not possible for logical reasons. Ultimately, it turns out that there are no provable statements at all; all theories are equally unprovable, even equally improbable (L 92f.). In addition to the induction problem, this is also due to the fact that observational statements may also contain errors. A decision must be made as to which statements are to be taken as true, which introduces a conventionalist element. In addition, what an observer perceives is always dependent on his prior knowledge, i.e. theory-bound and therefore questionable.

In the positive sciences, empirical observations (propositions) can therefore not form a solid basis of knowledge for logical reasons.

2.1.2 Critical rationalism

Karl R. Popper's critical rationalism takes account of this situation by making it clear that theories cannot be proven, but only refuted. "Boldness in conjecture on the one hand and rigour in refutation on the other: That is Popper's recipe. ... Intellectual honesty consists ... in precisely defining the conditions under which one is willing to abandon one's own position" (L 90). In order to be considered scientific, theories must be able to prohibit certain observations. If these observations do occur, the theory in question is refuted. "According to the logic of dogmatic falsificationism, the growth process of science consists in the repeated rejection of theories on the basis of hard facts" (L 95). Lakatos calls this naive falsificationism and a simpler version of it dogmatic falsificationism, although according to Lakatos this characterisation only applies to the early Popper. (Lakatos also distinguishes methodological falsificationism as a more complicated version of naïve falsificationism, which is not discussed here. In the following, "naïve" and "dogmatic" falsificationism are used largely synonymously.)

However, this does not provide a solution to the problem at hand. This is because falsification only occurs when observations are accepted as falsifying, which also introduces a conventionalist element here; Popper is well aware that a refutation is never compelling.

By the way, Popper distinguishes between the context of *discovery* – where does the theory come from, what inspired it? – and the context of *justification* – how can a theory be judged, is it justified? In other words, the philosophy of science or the question of the scientific nature of a theory is not about how a theory was arrived at, but whether the theory in question can be methodologically justified; for Popper, whether it is falsifiable (see Logic of Research, 9th ed., p. 257).

In this (naïve) conception, as in logical empiricism, protocol propositions (here referred to as basic propositions) also act as unquestionable arbiters. However, they can play this role here just as little as they can be the non-questionable basis in logical empiricism, because – as already stated – observational propositions are also fallible. Even those empirical observations that are capable of falsifying a proven theory can be put up for discussion. The acceptance of observational statements as falsifying or confirming instances is ultimately based on the conventional agreement of the scientific community, just like the acceptance of theories. The fallibility of our knowledge also affects the basic propositions or – to paraphrase Popper: "The basis fluctuates" (Logic of Research, p. 76).

The following therefore applies: "Dogmatic falsificationism unconditionally admits the fallibility of *all* scientific theories, but holds on to a kind of infallible empirical basis. ... There is an absolutely certain empirical basis of facts that can be used to refute theories" (L 94). Dogmatic falsificationism thus overlooks a problem: every component of a theory can be protected from refutation by changing other elements of the propositional system *(Duhem-Quine problem)*.

Lakatos (L 95) summarises: Dogmatic falsificationism is untenable because it is based on two false assumptions and on too narrow a criterion of demarcation between "scientific" and "non-scientific":

1. There is no natural, psychological boundary between theoretical, speculative propositions on the one hand and empirical or observational propositions on the other.

2. The truth value of "observational propositions" cannot be decided beyond doubt. Clashes between theories and statements of fact are not falsifications, but merely contradictions. "The distinction between the soft, unproven 'theories' and the hard, proven 'empirical basis' does not exist: all propositions of science are theoretical and incurably fallible" (L 98).

3. "The most admired scientific theories in particular are simply incapable of forbidding observable facts" (L 98; thus they are also not falsifiable; L tells an instructive fictional story about this, p. 98f.). The criterion "theories must be falsifiable" is too narrow.

This raises the question of on what basis a theory can ever be eliminated if scientific criticism itself is fallible. Naïve falsificationism cannot solve this problem.

2.1.3 Preliminary result

As a preliminary conclusion it can be stated: "The history of science suggests ... that tests are at least three-sided battles between two or more theoretical rivals and the experiment; and that some of the most interesting experiments led prima facie to a proof and not to a falsification" (L 112). In other words: It is not (falsifying) data that "fight" against theories, but (two or more) theories that fight against each other in an endeavour to explain data.

So is there any rational explanation at all for the success of science? We have already seen that there is a conventionalist element in falsificationism: A decision must be made as to which data are to be regarded as anomalies and thus as potential falsifications. This conventionalist element (which cannot be eliminated) should – according to Lakatos – be reduced and the naïve forms of methodological falsificationism replaced by a refined form "which gives new rational reasons for falsification and thus saves the methodology and the idea of scientific progress" (L 112f.).

2.1.4 Sophisticated versus naive falsificationism

"Sophisticated falsificationism differs from naïve falsificationism in its rules of *acceptance* (or the 'demarcation criterion' [when is a theory scientific? RJ]) and its rules of *falsification* or elimination [when should a theory be discarded? RJ]" (L 113).
A theory is acceptable here if, compared to a predecessor, it
(1) has a (falsifiable) excess of empirical content and
(2) part of this excess has been verified.
A theory T is therefore falsified if
(1) another theory T′ has an *excess of content* compared to T (i.e. it predicts *novel* facts that are improbable or even forbidden in the light of T; this is what is meant by *"empirical content"*),
(2) T′ explains the earlier success of T,
(3) part of the excess content of T′ is proven (L 114).

It is therefore a matter of imposing certain conditions on the theoretical adjustments with which one may save a theory (i.e. protect its hard core, see below) (L 114).

"This means that every scientific theory must be judged together with its auxiliary hypotheses, initial conditions, etc., and especially with its predecessors, so that we can see what kind of *change* it has brought about. But then, of course, we are judging a *set of theories* and not isolated theories" (L 115).

2.1.5 Progressive problem shifting

Series of theories are to be developed; the individual versions of this series should enable a so-called *progressive problem shift*. This means that each new theory should have an excess of content (see above) compared to its predecessor. If part of the excess content is proven, the series is empirically *progressive*. Otherwise, the series is *degenerative*, i.e. the theory was only supported by rescue efforts without this leading to new knowledge. "Sophisticated falsificationism thus transforms the problem of evaluating *theories* into the problem of evaluating *series of theories*" (L 116).

2.1.6 General consequences

The following important consequences result from this conception:

1. There is no falsification before the emergence of a better theory (L 117). "If falsification depends on the emergence of better theories, on the invention of theories that anticipate new facts, then of course it is *not* simply a relation between a theory and the empirical basis, but a multi-part relation between competing theories, the original 'empirical basis' and the empirical growth to which the competition of theories leads" (L 177). Counterevidence in relation to a theory T_1' (a subsequent development of T_1) is a proving instance of the competitor T_2, which either contradicts T_1 or is independent of it (provided that T_2 is a theory that satisfactorily explains the empirical success of T_1) (L 117).

2. it is not falsifications (or anomalies) that are decisive, no matter how many there are; it is also not such supporting observational data that are explained by *all* theory competitors, but such data that are explained by one theory competitor but represent an anomaly for the other. "We are no longer interested in the thousands of trivial verifying instances, nor in the hundreds of easily accessible anomalies: what matters are the few decisive *excess-verifying instances*" (L 118).

3. Progress does not occur through the search for disproving data, but through the introduction of new theories that can develop into competitors. "The problem fever of science is heightened by the proliferation of competing theories and not by counterexamples and anomalies" (L 118). "While naive falsificationism emphasises the 'urgency' of 'replacing a *falsified* hypothesis with a better one', sophisticated falsificationism emphasises the urgency of replacing *every* hypothesis with a better one. Falsification is not a circumstance that 'forces progress', simply because falsification cannot precede the better theory" (L 119). Only those anomalies are threatening that a theoretical rival is able to solve progressively.

4. As *a criterion for delimiting* between scientific and non-scientific, it follows that it is a *succession* of theories (which must fulfil the above conditions) and not a given theory that is evaluated as scientific or pseudo-scientific.

2.1.7 Consequences for creation research

It is not only legitimate, but also beneficial and desirable for the gain of knowledge to introduce theory rivals to established theories. “And finally, the honesty of sophisticated falsificationism demands that one try to look at things from different angles, that one propose new theories that anticipate new facts, and that one discard theories that have been superseded by other, stronger theories” (L 120).

In my opinion, the situation is more complicated in the debate between evolutionary and creation theories than in the above description. Is one of the two competitors able to explain everything that the other competitor explains? Both competitors have to deal with anomalies *at different points*, so that a global comparison of theories is difficult. One theory may have a progressive content excess in one particular area, while the other can trumps in another. A comparison of theories will only be possible in the area of partial theories (cf. 3.).

But even in the areas where they do not overlap, they can still be appraised by analysing how progressive they are. If the naturalistic research program is degenerative in the area of origin of life, while the creation research programme is progressive in the area of basic type biology (see ch. 3.2), that still speaks to the advantage of the creation research programme.

2.2 The construction of research programmes

2.2.1 Overview

As already mentioned, according to Lakatos science is a competition of research programmes. A *research programme* leads to a linear series of theory versions. The justified transition from one theory version to another is regulated by methodological criteria. The following conditions apply (cf. 2.1.4):
(1) The modification is consistent with the positive heuristic (see below).
(2) The successor explains the success of the predecessor.
(3) The successor predicts *novel* empirical findings.
(4) These are at least partially confirmed.
If (1) - (3) apply, the research programme is *theoretically progressive*.
If (1) - (4) apply, the research programme is *empirically progressive*.

Research programmes consist of a hard core and a protective belt. The hard core contains basic assumptions on which the research programme is based and which are not questioned (neither rejected nor changed). These basic assumptions are determined by *decisions* (conventionalist element). The hard core “consists of some very general, theoretical hypotheses that form the basis from which the programme must be developed” (Chalmers 82).

What happens if the agreement between an elaborated research programme and the observational data is inadequate? This should not be attributed to the assumptions of the hard core, but to the *protective belt of auxiliary hypotheses.* Its task is to protect the hard core by means of auxiliary hypotheses, initial conditions, theories underlying the observations (e.g. measurement theories), etc. The protective belt “does not consist only of explicit auxiliary hypotheses that supplement the hard core, but also of assumptions that underlie the description of the initial conditions and also the observational statements” (Chalmers 82). Changes or additions to the protective belt of a research programme must be independently verifiable and offer the possibility of new verifications and thus the possibility of new discoveries (Chalmers 85).

2.2.2 Research programmes

“According to Lakatos, a research programme is a structure that provides a guide for future research in both positive and negative ways” (Chalmers 82). A distinction is made between negative and positive heuristics (see below). The realisation of the research programme should lead to further assumptions being added to the hard core in the attempt to provide explanations for already known phenomena and to predict new phenomena. (Lakatos did not, it seems, share Chalmers’ view that the ‘hard core’ could be altered in this way. According to Lakatos, changing the ‘hard core’ essentially means working with a new research programme.)

“Research programmes are *progressive* or *degenerative*, depending on whether they successfully lead to the discovery of novel phenomena or whether they repeatedly fail to do so” (Chalmers 82).

“The development of a research programme involves not only the inclusion of appropriate auxiliary hypotheses, but also the development of appropriate mathematical and experimental techniques” (Chalmers 83).

2.2.3 Negative heuristics

Negative heuristics refers to endeavours to *protect* the hard core by expanding and modifying the protective belt; it does not lead to new knowledge, but indicates research paths that should be *avoided*. “The negative heuristic of a programme corresponds to the requirement that during the development of a programme the hard core of a programme must remain unchanged and unaffected” (Chalmers 83).

2.2.4 Positive heuristics

The positive heuristics consist of endeavours to *expand* the hard core in order to explain further findings and indicate research paths to *follow*. "The positive heuristic contains broad guidelines that indicate how the research programme might be developed" (Chalmers 82). "The positive heuristic indicates how the hard core must be supplemented so that it is capable of explaining and predicting real phenomena" (Chalmers 83).

"The positive heuristic consists of a partially articulated set of suggestions or hints as to how to modify and develop the 'disprovable' versions of the research programme and how to modify and refine the 'disprovable' protective belt" (L 131).

"The positive heuristic outlines a programme that represents a chain of increasingly complicated models for simulating reality" (L 132).

2.2.5 No "immediate rationality"

Alternative research programmes that enter the scientific competition as rivals cannot be superior immediately. They need time to develop, and this time must not be taken away from them ("protection of youth"). "A research programme must be given the opportunity to demonstrate its full potential" (Chalmers 84; by saying "must", he probably means that this is how things should be, not that editors of research journals or funding committees have to do that).

"Because of the uncertainty of the success of future attempts to develop and test a research programme, it can never be said of a research programme that it is unquestionably degenerate" (Chalmers 87).

2.2.6 Differences to falsificationism

"When a programme has developed to the point where it can be subjected to observational tests, then, according to Lakatos, it is the proofs rather than the falsifications that are decisive. A research programme is required to be able to make new predictions at least temporarily, which then also prove themselves" (Chalmers 84f.). Here "novel" means unexpected or even forbidden in competing theories.

"For the falsificationist, the inability to locate the source of the difficulties ends in a haphazard chaos. Lakatos' scientific approach is sufficiently structured to avoid this consequence. Order is maintained by the irreplaceability of the hard core and by the positive heuristics that accompany it. The candid development of meaningful conjectures within this framework will lead to progress, provided that some of the predictions arising from these conjectures occasionally prove successful" (Chalmers 86).

"The problems that scientists working rationally on powerful research programmes select for treatment are determined by the positive heuristics of the programme rather than by psychologically disturbing (...) anomalies. The anomalies are registered, but pushed aside in the hope that after a while they will turn into proofs of the programme. ... For naïve falsificationists this all sounds abominable ..." (L134).

3 Application to creation research

3.1 The relationship between biblical narrative and the creation theory research programme

If Lakatos' concept is to be applied to theories within the framework of creation theory, the hard core must first be accounted for. *The biblical texts themselves cannot act as the hard core of a research programme,* as they are too vague for this purpose; however, they serve as a starting point for the development of a hard core, which must therefore originate from a context-appropriate exegesis or at least be compatible with it.

At this point it must be pointed out that the subject matter at issue in the debate about creation / evolution can only be analysed to a comparatively limited extent using the methods of natural science, as it involves the *reconstruction of a unique past event*. This process cannot be analysed directly and repeatedly like a regular event today. Reproduction is therefore not possible. There are only a few snapshots from the past (e.g. in the form of fossils) of the object of research (the history of living organisms). For the methodology of natural history research, see Junker & Widenmeyer (2021).

Data e.g. on the structure and function of organs, sequence analyses of proteins and DNA, ecological relationships of living organisms, distribution of living organisms etc. can be used as a test instances for historical reconstructions, as can data from geology and palaeontology. Accordingly, Lakatos' concept can also be applied to historical reconstructions.

This is where there is a certain difference between evolutionary and *biblical* concepts of creation. Historical and causal theories of evolution result from the naturalistic approach; at its hard core are the following relatively general specifications: there is a purely natural explanation for evolution (based on the laws of nature, chance and initial conditions); there is a tree of life for all living organisms (or species); and vast periods of time are involved. The biblical doctrine of creation is based on more *concrete, substantive* specifications, albeit with considerable flexibility. As mentioned above, the sentence "There was a general evolution of living beings" is the *de facto* basis for the *content* of evolutionary research.

Let us return to Fig. 1: The hard core must now be formulated in concrete terms, taking into account the exegetical scope for interpretation (3). By defining the hard core, a certain possible interpretation is provisionally fixed. At the same time, the stage of science is entered, and all further steps proceed methodically in the same way as research under naturalistic guidelines.

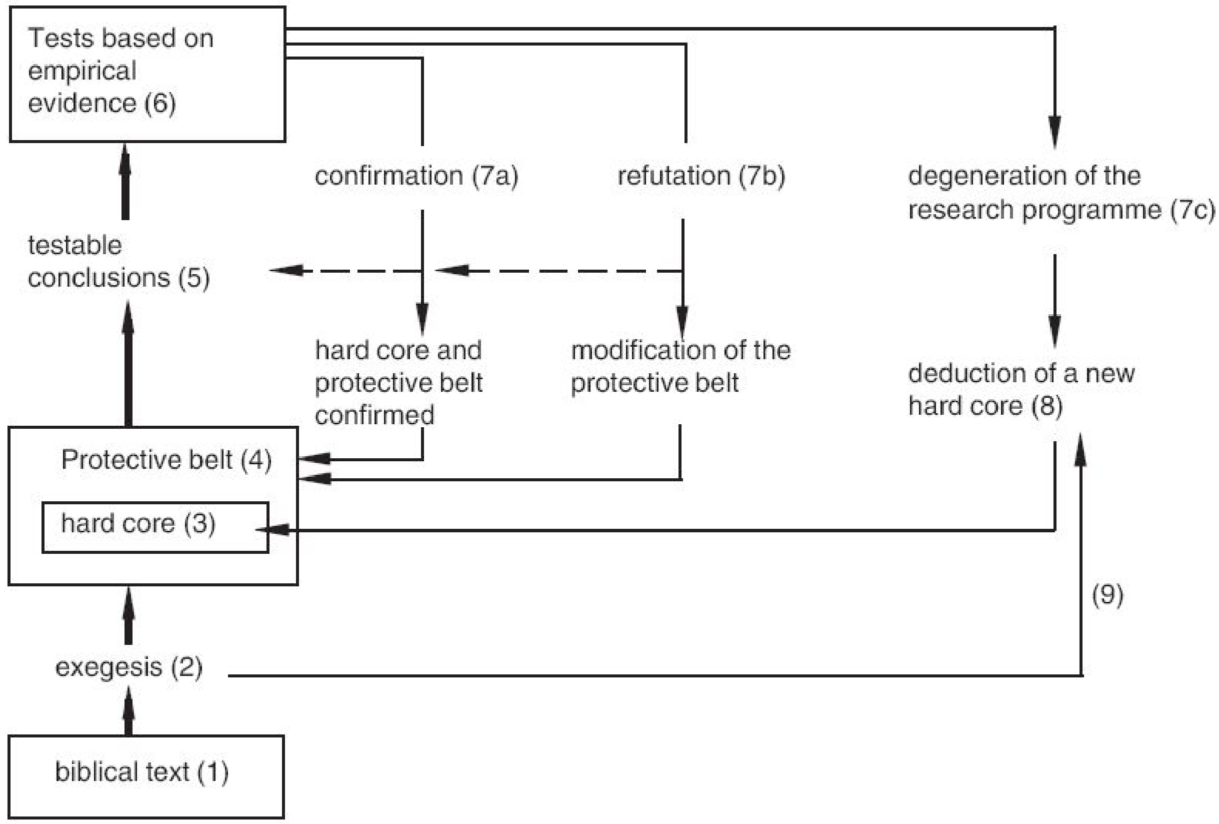

Fig. 1 (modified after R. Junker, Leben durch Sterben?, p. 242) is intended to illustrate the connection between the biblical narrative and the theories of creation research motivated by it and based on it (here: historical reconstructions). The starting point (1) is the biblical texts, which are to be interpreted according to the text and context. Exegesis (2) must not be determined by scientific theories. It may take scientific findings into account, but these must not become the key to interpretation. Up to this point, we are in the realm of dogmatic and still in the preliminary stages of scientifically investigable questions. Evolutionary research also takes place against an ideological background according to which no supranatural influences have had an effect in the history of life. This assumption is not a result of empirical research, but a decision in the sense of naturalism. Naturalism means that only natural processes have had an effect on the history of life. (From a Lakatosian perspective, it could be argued that naturalism was part of a progressive RP. So the assumption of naturalism can be appraised by how progressive its research programme is.)

The hard core is protected by a belt of auxiliary hypotheses (4). The core and the belt must allow conclusions to be derived from them and be accessible to testing on the basis of empirical data (5). If this test is carried out (6), the results can confirm the conclusions (7a), which means that the research program has been successful. If the test turns out negative (7b), the framework of the auxiliary hypotheses must be modified or supplemented. If this procedure proves to be degenerative in the Lakatosian sense (see above) in the long term (7c), then the hard core must not be taboo either (8); however, its reformulation must again take place with due regard for the exegetical leeway (9). Step 9, like step 2, is in the area of textual interpretation and dogmatics.

Fig. 1 can also be translated into a circular diagram (Fig. 2).

3.2 Basic type biology

The general procedure described above will now be applied to a comparatively well-developed area of creation research.

3.2.1 Overview

Basic type biology in creation research is based on the general testimony of creation in the Bible. Everything visible, explorable and accessible to human knowledge was created by the word of God (Heb 11:3). What this sentence means in detail will not be developed here. In basic type biology, the creatorship of God is interpreted in such a way that all basic types of living beings are in existence in perfect form from the beginning of their existence. The history of life begins with polyvalent basic types (see below for the term "polyvalence"). In the doctrine of creation, the "created kinds" are referred to as "basic types"; the basic type concept must be distinguished from other species concepts. Basic types can be defined relatively precisely (cf. Scherer 1993). In particular, basic type biology refers to the phrase "each according to its kind" in the creation account (Genesis 1); a formulation which shows that the animate creation is divided into distinguishable groups. As explained elsewhere, the biblical use of the term "min" (for "kind") leaves open what exactly is meant by this (cf. Junker 1994, section 5.5.1).

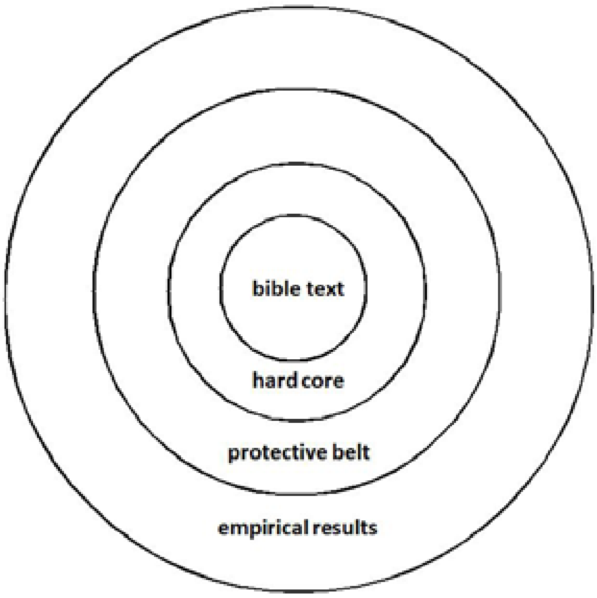

Fig. 2

The aim of basic type biology is to show
• that basic types can be distinguished from each other according to the given definition,
• that the basic types possess variation mechanisms through which today's diversity within basic types could arise from a polyvalent (see below) ancestral form, so that numerous species splits (speciation) could also occur within basic types,
• that these processes of basic type diversification could take place within a few thousand years, and
• that limits to the variability of the basic types can be made plausible.

3.2.2 The hard core

The following statements can be cited as the hard core of basic type biology:
• Living beings exist from the beginning of their existence as discrete units of creation (basic types).
• Living beings came into existence in the week of creation ("simultaneously") through God's word.
• The basic types have existed for approx. 10,000 years.
• The basic types are only changeable to a limited extent.
• Basic types cannot be evolutionarily transformed into other basic types.

This hard core is – as explained in 3.1 – to be distinguished from the biblical texts and is formulated more concretely than these, but it is unconstrainedly compatible with the biblical texts. Only the last sentence is not closely related to the biblical texts, but can also be indirectly presented as biblically based (cf. some contributions in Junker 2022).

3.2.3 Protective belt (auxiliary hypotheses)

The hard core cannot be tested directly on the basis of observational data. In order to be able to confront it with data, auxiliary hypotheses are formulated as follows:

1. A *basic type definition* is established, thus determining how the "units of creation" presupposed in the hard core can be recognized *today*. All living beings that are connected to each other through crossbreeding are summarized as basic types, whereby the genetic material of both parents must be expressed in the hybrids. It does not matter under what circumstances the crossbreeding was carried out (in the wild, captivity, artificial insemination or pollination, etc.) and to what extent the hybrids are fertile. (There are biological reasons for this definition, which will not be discussed in detail here, cf. Scherer 1993.) The basic type definition can be verified on the basis of observational data. It can be seen that, according to this definition, groups of organisms can be distinguished from each other as basic types.

2. It is not only assumed that basic types were created separately in the beginning (this is part of the hard core), but that they can also be clearly differentiated today according to a suitable basic type criterion such as that mentioned under 1.

3. The known mechanisms of variation (mutation, selection, etc.) as well as pre-existing variation programs lead to diversity within the basic types. Within the framework of the basic type model, there is also interest in the discovery of previously unknown variation mechanisms, with the aim of being able to explain better – or at all – how a considerable range of variation can be developed *in a short period of time*. In recent years, biological research has made great progress, so that the existence of variation programs can be empirically verified (e. g. plasticity, transposons).

4. The ancestral forms were *polyvalent*, i.e. (1) to a considerable extent heterozygous, so that by combining the genetic material during sexual reproduction, new expressions of phenotypes (external shape and characteristics) could arise again and again, and (2) equipped with variation programs. This hypothesis should also contribute to understanding how diversity within the basic types could *arise in a short period of time* – namely by the fact that diversity does not have to be gradually acquired through mutations (which is time-consuming), but is already present to a considerable extent from the beginning and only needs to be expressed (Mendelian speciation, cf. Crompton 2019).

3.2.4 Positive heuristics

As a reminder, "The positive heuristic contains broad guidelines that indicate how the research program might be developed" (Chalmers 82). It indicates research paths to follow in order to build on the hard core to explain further findings.

Following the auxiliary hypotheses, the following research possibilities and questions arise:
1. By applying the basic type definition, it should be possible to clarify whether basic types today can be distinguished from each other on the one hand and whether they have a close internal crossover relationship on the other.
2. Furthermore, the basic type concept can also be applied in palaeontology, albeit not as stringently as in extant species, as the defining criterion of crossability cannot be applied. Nevertheless, it can be investigated whether groups of organisms can be delimited according to morphological criteria, which could therefore be interpreted as basic types.
3. Is there evidence of rapid diversification?
4. Is there evidence that speciation occurs primarily on the basis of polyvalent ancestral forms and represents a process of specialization?
5. Is there evidence of polyvalent ancestral forms? (cf. Junker & Scherer 2013, VII. 16.3).
6. Is there evidence of variation programs?
7. Is there evidence of an originally high degree of interbreeding and plasticity?
8. Is there evidence of boundaries between basic types? (cf. Junker & Scherer 2013, VII)

The following results supporting the basic type model can be mentioned for these eight points:

Ad 1: About 25 basic types have been described so far; the concept of distinguishable basic types has proven its worth so far. The following should be noted: Within basic types, numerous intersections are usually known, even across different subgroups. There is a sharp boundary to neighboring basic types, beyond which there are no crossings. Such a situation does not correspond to evolutionary expectations (transitions should primarily occur at all taxonomic levels), but it does correspond to the predictions of the basic type model.

Ad 2: According to previous studies, the basic type level is at the level of the family or between genus and family, in rare cases at the order level. At this level, discontinuities are also *regularly* found in the fossil record.

Ad 3: In recent decades, numerous studies have been published that demonstrate rapid speciation and diversification within a few generations.

Ad 4 and 5: There is a great deal of evidence for this, which is beyond the scope of this article, so refer to Junker & Scherer (2013), Chapter VII.16.3.

Ad 6: There is increasing evidence for variation programs, for example jumping genes. The search for further types of variation programs represents an interesting research program.

Ad 7: For example, Crompton (2020) uses hybrids among birds of paradise to show that their ancestors must have been more heterozygous than their descendants. Regarding plasticity: several models of plasticity change assume an initially high degree of plasticity that tends to decrease over generations (for an overview, see Junker 2016).

Ad 8: A large number of studies show the absence of a mechanism for macroevolution (Junker 2023)

The points mentioned here have only been formulated briefly so as not to go beyond the scope of the article and require more detailed descriptions.

3.2.5 Anomalies

Possible anomalies in basic type biology are related to the geological short-term model in which it is classified.

1. Many basic types are very extensive and consist of several hundred biological species that can exhibit considerable morphological diversity. For example, peacocks, pheasants, turkeys, the domestic fowl and many other birds of the pheasant family (Phasianidae) belong to a basic type. The plant genus *Senecio*, which presumably belongs to a single basic type, comprises herbaceous to tree-like species. Are a few thousand years enough to explain today's diversity within basic types through the known mechanisms of variation based on the above-mentioned protective belt? It is clear that rapid diversification is only possible if there are pre-existing variation programs and morphological diversity does not have to be built up by evolutionary mechanisms, but only activated. It has already been noted above that increasing evidence for this has been found. It therefore seems justified to speak here of a progressive problem shift.

2. In addition to morphological diversity, the considerable molecular differences within basic types, which are attributed to point mutations, must also be explained in a short time frame. Such an explanation is currently lacking.

3. Further questions arise in connection with geological issues, such as the question of the systematic absence of many basic types in the Palaeozoic and Mesozoic and the question of the spread of basic types on Earth within a few hundred years after the Flood.

3.2.6 Previous and possible future development of basic type biology (progressive problem shift)

Research programs should show a progressive problem shift, i.e. the given theory should be further developed in such a way that the individual versions of this series have an excess of content compared to their predecessors, i.e. make additional predictions. At least part of the excess content should prove itself empirically. If the program versions do not lead to an empirically proven excess content in the long term, so that only ad-hoc hypotheses cover up the anomalies, the research program has degenerated and has not proven itself (for the time being).

In the past, the basic type concept (in the broad sense of the concept of "created kinds") has been extended several times and has led to progressive problem shifts. These can be counted as such:

• The transition from a rigid to a flexible species concept. The early Linné regarded biological species (i.e. narrowly defined) as units of creation, but very soon Linné moved on to genera as units of creation (cf. Landgren 1993). Today, these have been replaced by basic types, which can be defined relatively precisely on the basis of considerably expanded biological knowledge.

• In more recent basic type biology (from the 1980s onwards), there is a tendency to concede ever greater variation potential to basic types (polyvalent stem forms, programmed variability, variation programs, jumping genes).

In the future – depending on further findings - basic type biology could develop as follows:

• A modification of the basic type definition might become necessary, either in a more precise form than previously possible, or in a modified form based on new findings.

• Perhaps the expectation of a sharp and universally valid delimitation of basic types must be dropped. This could possibly lead to a degeneration of the research program of basic type biology.

It should also be noted that the past and possible future changes mentioned do not affect the hard core, which takes account of the negative heuristic. Note that the hard core does not imply that the basic types must be sharply definable today (the biblical texts do not explicitly require this); this is part of the protective belt.

3.2.7 Comparison with the evolutionary model

Finally, the research program of the macro-evolution theory will be compared with that of the basic type theory. Is basic type biology a serious competitor? This comparison is made in brief. The theory of evolution explains (at least in part):
• Mechanisms of variation, e.g. mutation, selection, genetic drift,
• speciation (splitting of species into two or more daughter species) and
• specialization, optimization of individual traits

Anomalies in the context of evolutionary theory:
• The bridging of basic functional states is unexplained (i.e.: evolutionary mechanisms are not sufficient to explain new things in terms of macroevolution) (cf. Junker & Scherer 2013, Ch. IV.9).
• The systematic separability of living organisms at the basic type level; a continuum of forms would generally be closer.
• The extensive systematic lack of evolutionarily suitable transitional forms and the frequently "explosive" nature of the occurrence of form groups in the fossil record.
• The widespread occurrence of complex convergences (cf. Junker 2002, Braun 2012).
• The widespread non-fit of morphological and molecular phylogenetic trees
• The widespread reticulate similarity relationships of higher taxa in both the morphological and molecular areas.

The basic type model explains both the success and the aforementioned anomalies of the evolutionary model, but has to contend with anomalies related to the problem of time (diversification of basic types within a few thousand years), which does not exist in this form for evolutionary theory (e.g. in the interpretation of the fossil record). Another major problem is the explanation of the fossil sequence (cf. Stephan 2002). Further research may of course lead to a shift in the anomalies and possible explanations, but that is a long way off.

3.3 Concluding remarks

Basic type biology is probably one of the best developed research programs in the field of creation science. In other fields of knowledge, the comparison with evolutionary research programs is not always as favorable, but it is possible to proceed in a similar way as in the case of basic type biology. The example illustrated here could provide a model of how creation theory research programs can be presented and made transparent to those who think differently.

3.3.1 The research program concept: suitable for the doctrine of creation?

At the outset, the question was raised as to whether the doctrine of creation needs its very own theory of science or whether it can take up existing concepts in order to possibly modify them. In my opinion, Lakatos' conception offers a suitable framework for the following reasons:

1. it explicitly allows for dogmatic determinations in the sense of a hard core. The biblical doctrine of creation and the creation research based on it cannot do without this.

2. It acknowledges that the new alternatives need time (possibly several generations of scientists) to develop and that they must not be "aborted" prematurely. Examples from the history of science prove that this is a reasonable protection. Creation research needs this time all the more as only a few scientists are working on their research programs.

3. Creation theories are also fallible – in contrast to their motivating background, the Word of God. Creation research must take this into account by not becoming dogmatic in places where the Bible makes no stipulations. The creation researcher is also fallible as a Christian and requires correction. Lakatos' conception contains practicable rules for dealing with fallibility which, in my current view, do not require any special modifications for the field of creation research.

3.3.2 Differences between the doctrine of creation and naturalistic sciences

A fundamental difference between origins research based on the biblical doctrine of creation and evolutionary research based on naturalism has already been pointed out. In basic type biology, concrete content-related specifications are made. These include the existence of ready-made, discrete units of creation of life (basic types) from the beginning and a brief history of life. In this respect, there is a dogmatic fixation that is not necessarily given from the outset in a comparable way within the framework of evolutionary theory. It has been pointed out that in practice, however, there are also dogmatic fixations within the framework of evolutionary research, firstly on naturalism, which in evolutionary biology is more than a heuristic (because the option of "creation" is excluded in principle), but then also on the "fact of macroevolution", which is not put up for discussion even despite serious anomalies and despite refuted expectations (cf. Junker 2021).

It should be noted that the aforementioned dogmatic requirements of the doctrine of creation are rather vague and need to be substantiated (see Fig. 1). This is one reason why the results of creation-oriented research are not fixed from the outset. In addition, a number of questions were mentioned in section 3.2.4 which the basic type biology approach leads to. There are many scientifically treatable questions that are motivated within the framework of basic type biology; this approach can promote the acquisition of knowledge.

In the context of evolutionary and creation science, there are different expectations as to what can be achieved through naturalistically oriented research. In the context of creationism, for example, it is expected that all attempts to explain the origin of life through natural processes will fail. In terms of evolutionary theory, the opposite is expected. Nevertheless, the question of how life originated can be addressed within the framework of both theories of origin, e.g. by exploring which processes are physico-chemically possible without specific guidance.

It was mentioned at the beginning that the doctrine of creation is denied scientific validity because it does not lead to an increase in knowledge, because its results are a foregone conclusion and for other reasons. In fact, the scientific clarification of certain questions such as the origin of life is regarded as unrealistic from the outset - although this is biblically motivated, there are increasingly strong empirical reasons for this: The phrase "Omne vivum ex vivo" has been confirmed countless times. It is certainly one of the best-founded empirical theorems in biology and is based on the known laws of chemistry. There is therefore no good reason to pursue this research program any further, based on the sustained failure of previous experiments. Time and again, it has been shown that experiments in this field only succeed if massive control measures are taken and an abiotic scenario is not simulated.

Critics interpret this assessment as a renunciation of knowledge. However, two things need to be considered here: Firstly, there is of course also interest in new findings from biogenesis research within the framework of the doctrine of creation; scientists who think differently are even asked to refute the sentence "Omne vivum e vivo". The own position that life cannot arise naturally is explicitly subjected to the possibility of refutation.

Secondly: If evolutionary theorists no longer question and attempt to refute what they believe to be a well-founded sentence "There was a general evolution of living beings", this would also mean renouncing knowledge in the sense of the criticism mentioned. Which evolutionary theorist conducts research to disprove the "fact of the general evolution of living beings"? Or: Many organs have already been declared useless or misconstrued because they were interpreted as regressed from an evolutionary perspective. If no (significant) function is expected, there is no need to research it. This kind of renunciation of research has often been practiced for reasons of evolutionary theory. Or: Why do evolutionary theorists not investigate whether there are clearly definable basic types according to the basic type criteria? Because they consider this to be unrealistic in the context of their point of view. The list of such examples could go on and on.

Which phenomena can occur naturally in detail is not clear from the outset for either concept of origin. It is therefore also of interest for the doctrine of creation to explore the scope of evolutionary changes or natural physico-chemical processes. However, the expectations of the results of the research are different. And the assessments of the available results are undoubtedly also different.

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