Carnap's Conditions of Adequacy for Explications and Conceptual Engineering[*]

Christian J. Feldbacher-Escamilla

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Abstract

[487] In this paper, it is argued that the development of Carnap's methodological approach (from rational reconstruction to explication) can be framed as a development of weakening conditions of adequacy for transformative conceptual analysis. It is then argued that these conditions are also guiding for the contemporary revisionary project of conceptual engineering.

Keywords: rational reconstruction, explication, conceptual engineering, Cappelen's dilemma

1 Introduction

Rudolf Carnap's approach of explication was and is an important methodological cornerstone of analytic philosophy. Though there is some relevant overlap between explication and traditional conceptual analysis due to its descriptive component, it also importantly exceeds traditional analysis due to its prescriptive or revisionary or transformative component (cf. Beaney 2014, sect.6). In recent years, revisionary approaches to concepts received a new impetus by generalising it along all dimensions such that any form of explicit and intentional (cf. Brun 2020, sect.1) formation of concepts, representational devices, theories, and even methodologies that is guided by normative considerations regarding improvement (cf. Cappelen 2018, p.3) counts as an approach in this vein. The general heading of this approach is 'conceptual engineering' (cf. Creath 1990, p.7; and Blackburn 1999, p.1). However, also other labels became famous such as 'revisionary projects' (cf. Haslanger 2000, p.32), 'ameliorative projects' (cf. Haslanger 2005, p.11), 'conceptual ethics' (cf. Burgess and Plunkett 2013a), or,

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if the revision is guided by experimental philosophical results, also 'naturalised conceptual analysis' (cf. Machery 2017, chpt.7).

In this paper, we argue that Carnap's methodological approach of rational reconstruction and explication can be framed as a development of widening conditions of adequacy that resulted in the requirements of similarity, exactness, fruitfulness, and simplicity, which he finally put forward in his [488] *Logical Foundations of Probability* (1950/1962) and discussed further in his *Replies and Systematic Exposition* in the Schilpp volume on his philosophy (1963). In doing so, he passed trough stages of conceptual explanation and modest explication until he ended up with his account of "full-blown" explication. What is more, we will argue that also the meta-theory of conceptual engineering can be located in this development of widening conditions.

In our investigation, we will focus on the rational reconstruction, explication, and revision of *concepts*. What we call a 'concept' here is just a triple consisting of an expression e, its intension I, and its extension E (on some occasions our notion of a *concept* will be more fine-grained including also *uses* of an expression and *subjects* or *topics* of a concept). The extension E of an expression e is the set of (actual and counterfactual) objects to which e applies, and the intension I is simply a functional relation that links the expression e to the extension E. Throughout the paper, we will assume that characteristic for conceptual changes is that the extension E of an expression e is modified due to changes in its intension I (cf. Cappelen 2018, p.85).

Our investigation proceeds as follows: In section 2, we provide four models of conceptual development: a model of conceptual explanation (2.1), one of modest explication (2.2), one of full-blown explication (2.3), and one of conceptual engineering (2.4). In section 3, we outline how these models can be brought into a trajectory of weakening the Carnapian conditions of adequacy for explications. In section 4, finally, we argue that Carnap's approach developed from the conceptual explanation of his forerunners via the modest explication of his rational reconstruction in the *Aufbau* towards full-blown explication in his later philosophy. We conclude in section 5.

2 Four Models of Conceptual Development

We think that in the literature on explication and conceptual engineering, four forms of conceptual development can be distinguished: *conceptual explanation*, which is about improving a concept in the sense that we get a better understanding of it, however, without revising it; *modest explication*, which is about revising a concept in a more or less uncontested way; *full-blown explication*, which is about a more committing revision of concepts in the way as, e.g., championed by Carnap particularly in his later work; and, finally, *conceptual engineering*, which is the approach investigated in current accounts of conceptual revisions. As we will argue, these four forms of concept formation are the result of increasingly generalised conditions of adequacy as explicitly put forward by Carnap only at a later stage. However, before we argue so, we want to

introduce four simplified models for these different forms of conceptual development. They are simplified in the sense that they mainly focus on extensional aspects. [489] For this purpose, we refine our terminology of the extension E of an expression e: Let us assume that the extension of an expression e can be distinguished into three subparts, i.e. every expression e can be assigned to three types of extensions: A *core extension* E_+ that consists of the set of all objects to which the expression clearly/really applies to; a *counter extension* E_- that consists of the set of all objects to which the expression clearly/really does *not* apply to; and a *vagueness extension* E_o which consists of the set of all remaining objects to which the expression neither clearly/really applies, nor clearly/really fails to apply to. Since conceptual development is about some change from an initial concept to a resulting concept, we will use 'A' and 'Ω' in superscript notation to differentiate these different types of extensions of the initial concept and the resulting concept. So, E_+^A, E_-^A, E_o^A are the three different types of extensions of an initial A-concept, whereas E_+^Ω, E_-^Ω, E_o^Ω are the respective types of extensions of the resulting Ω-concept.

Let us now come to our first model of conceptual development.

2.1 Conceptual Explanation

We define a conceptual explanation as a transformative process in which our initial grasp of a concept is improved so that the resulting grasp of a concept is in some way better. If we take $\mathcal{I}$ to be a subjective (grasping) interpretation function mapping an expression e to its grasped core extension: $\mathcal{I}_+(e)$, its grasped counter extension: $\mathcal{I}_-(e)$, and its grasped vagueness extension: $\mathcal{I}_o(e)$, we can say that our initial grasp $\mathcal{I}^A$ of these extensions of e ($\mathcal{I}_+^A(e)$, $\mathcal{I}_-^A(e)$, and $\mathcal{I}_o^A(e)$) is improved in the transformation to a resulting grasp $\mathcal{I}^\Omega$ of the extensions ($\mathcal{I}_+^\Omega(e)$, $\mathcal{I}_-^\Omega(e)$, and $\mathcal{I}_o^\Omega(e)$), if the resulting grasp $\mathcal{I}^\Omega$ is closer to the concept's real extensions than the initial grasp $\mathcal{I}^A$ is.

Two specifications are important here: First, an exact characterisation of closeness would demand to provide some aggregation measure for the comparison of the similarity of three pairs of sets; for our simplified model, we want to presuppose clear-cut cases where improvement consists in no reduction of grasping any of the extensions:

$$\underbrace{\mathcal{I}_+^A(e) \subseteq \mathcal{I}_+^\Omega(e) \subseteq E_+}_{\text{core-grasping-conservation}} \;\&\; \underbrace{\mathcal{I}_-^A(e) \subseteq \mathcal{I}_-^\Omega(e) \subseteq E_-}_{\text{counter-grasping-conservation}} \;\&\; \underbrace{\mathcal{I}_o^A(e) \subseteq \mathcal{I}_o^\Omega(e) \subseteq E_o}_{\text{vagueness-grasping-conservation}} \;\text{①ⓐ}$$

and an improvement in grasping at least one of the extensions:

$$\underbrace{\mathcal{I}_+^A(e) \subset \mathcal{I}_+^\Omega(e) \subseteq E_+}_{\text{core-grasping-improvement}} \;or\; \underbrace{\mathcal{I}_-^A(e) \subset \mathcal{I}_-^\Omega(e) \subseteq E_-}_{\text{counter-grasping-improvement}} \;or\; \underbrace{\mathcal{I}_o^A(e) \subset \mathcal{I}_o^\Omega(e) \subseteq E_o}_{\text{vagueness-grasping-improvement}} \;\text{①ⓑ}$$

Second, it is important to highlight that in a conceptual explanation the extensions of an expression or concept are not changed. [490] The core-, counter-,

and vagueness extension of the initial A-concept are the same extensions as the core-, counter-, and vagueness extension of the resulting Ω-concept. The only thing that changes is our grasp of these extensions. And the relevant condition of adequacy for conceptual explanation is that our grasp of these extensions improves as, e.g., specified by the conditions above.

2.2 Modest Explication

It is well known that Carnap has put forward four conditions of adequacy for explications (1950/1962, §3,p.7): ⓘ similarity, ⓘⓘ exactness, ⓘⓘⓘ fruitfulness, and ⓘⓥ simplicity. Modest explication is the transformation of a concept in accordance with a strict interpretation of these conditions. What is meant by this, should be illustrated by the help of the so-called *extensional approach to explication*. According to the extensional approach, a strict version of the similarity constraint can be modelled as follows (cf. Hanna 1968, p.36; for more details cf. also Feldbacher-Escamilla 2020, sect.4): Two concepts, an A- and an Ω-concept, involved in a process of explication are similar only if the core- and counter extension of the Ω-concept are treated conservatively with respect to the core- and counter extension of the A-concept in the sense that all elements of the core extension of the A-concept are also elements of the core extension of the Ω-concept and, likewise, all elements of the counter extension of the A-concept are also elements of the counter extension of the Ω-concept. Formally, we can state this necessary condition for similarity as follows:

$$\underbrace{E_+^A \subseteq E_+^\Omega}_{\text{core extensional correctness}} \quad \& \quad \underbrace{E_-^A \subseteq E_-^\Omega}_{\text{counter extensional correctness}} \qquad (2_a)$$

It is easy to see that this condition makes up for a necessary but not a sufficient condition of similarity in a strict sense that governs modest explication. The reason is simply that at least sometimes the relation between two concepts is in accordance with this condition, while at the same time we would not subscribe to the claim that a process of linking or developing both terms is a process of modest explication. Take, e.g., equipollent concepts such as Quine's (1951, pp.21f) *creature with a heart* and *creature with kidneys* that, due to their extensional equivalence, trivially satisfy this condition. However, we would not call a process that links or generates the latter concept out of the former a process of explication. As we will see later on, the condition of *similarity* is very hard to come by. Accounts of stronger forms of explication even throw in the towel in the search of necessary conditions for it. However, for modest explication this seems to be a viable way to go – such forms of explication are in fact modest because they do not allow for re-assigning elements of the original core- and counter extension.

[491] In the extensional approach to explication, the desideratum for the exactness constraint amounts simply to the claim that the vagueness extension is reduced. Formally, we can express this as follows:

$$\underbrace{E_o^{\Omega} \subset E_o^{A}}_{\text{reduced extensional vagueness}} \qquad (2b)$$

It is clear that this extensional condition makes up only for one particular feature of exactness as described by Carnap (1950/1962, §3, p.7). So, e.g., the choice of the logical or linguistic framework is not at all touched by this. Also, it is not about a qualitative notion of exactness, but about a comparative notion: If an explication satisfies the other conditions, it is adequate already if the resulting Ω-concept, i.e. the *explicatum*, is clearer in the sense of being more extensionally determinate than the initial A-concept, i.e. the *explicandum*. In this model, there is no need to show that the explicatum is sufficiently clear.

For reasons of simplicity, we cannot fully address the conditions of fruitfulness and simplicity in the account of modest explication here. One way of embedding these conditions into the model might consist in putting forward a constraint for intensional complexity (covering simplicity: how complex is the intension I or our subjective interpretation function $\mathcal{I}$) and deductive power paired with intensional complexity (covering fruitfulness: how many true universal consequences with low complexity of I or $\mathcal{I}$ can be gained by using a concept). However, for our purpose it suffices to note that in general a non- or modest revisionary conceptual improvement as outlined above will tie in quite well with these other conditions in applications of the model: Regarding fruitfulness, by shifting neutral cases from E_o^A to E_-^{Ω} or E_+^{Ω}, one can in general formulate simpler regularity claims without the need of extra including or extra excluding elements of the vagueness extension from the regularity claim. A case in point is, e.g., the non-revisionary explication of the concept of a *prime number* (through the end of the 19th century some important mathematicians considered 1 prime, and some did not – e.g. G.H. Hardy is considered to be *the last* major mathematician taking 1 to be prime – , so that for this time one can consider 1 to be in E_o^A of the concept of a *prime number*). It is well known that the decision to exclude 1 ($1 \in E_-^{\Omega}$) allows, e.g., to easily state *the* fundamental theorem of arithmetic (every number can be *uniquely* written as a product of primes). Also regarding simplicity it seems reasonable to assume a positive tendency since in general humans seem to be better in dividing domains into two partitions (E_+, E_-) by the help of some general characteristics than dividing domains into three partitions (E_+, E_-, E_o). In fact, however, these criteria can also get easily in tension with each other (for a systematic overview of tensions between the conditions cf. Feldbacher-Escamilla 2020, sect.4). In such a case one needs some weighting or balancing between them.

[492] Although the extensions of the involved concepts change (from the A-concept to the Ω-concept), this form of explication is only modestly revisionary in the sense that regarding the conceptual core nothing really problematic happens: The only change going on is one of shifting objects from E_o to one of E_+ and E_-; since in some sense there was a dissent about this domain already before the explication, no wonder if there will be an ongoing dissent about it afterwards. An example of such a modest revision is Gottlob Frege's suggestion on how to deal with claims containing "empty descriptions", namely to assign

an arbitrarily chosen object (e.g. the null-class) to them and, by this, improve a language with an ordinary concept of *truth*, which is, e.g., undetermined regarding a claim with an empty description 'The present King of France is bald.' (in E_o^A) to a regimented language with a regimented concept of *truth* being determined in this respect (in E_-^Ω).

We can briefly sum up the main conditions of the model for modest explication as that of the preservation of the conceptual core (E_+, E_-) and that of the reduction of vagueness (regarding E_o).

Now, modest revisionary explications and non-revisionary explications in the sense of conceptual explanations cover best the tradition of conceptual analysis in the sense of *making something explicit* without (really) revising it – Cappelen (2018, sect.2.1.13) calls such an approach *descriptivist*. The approaches of full-blown explication and *conceptual engineering* expand the descriptivist's aim of making clear how a concept *is* used by adding a revisionist aim of showing also how a concept *ought* to be used. The main motivation of the *revisionist* is based on the assumption that some/many/all concepts are defective in some sense and that we can improve some/many/all of them (or at least aim at improving them – such a weakened form is, e.g., held by sceptics regarding the transparency of improvement within the revisionist camp; cf. Cappelen 2018, p.75). So, whereas descriptivists aim at something like conceptual *uncovering*, revisionists allow also for changes, for full-blown explications and *engineering*. In the following subsections, we briefly describe the latter two revisionist approaches.

2.3 Full-Blown Explication

What we want to call 'full-blown explication' here, is what Carnap (1950/1962, §3) more ore less explicitly characterised as a – not necessarily sequential (cf. Brun 2020) – two-step process, in which (i) one initially clarifies the intended meaning of the initial concept, the *explicandum* and (ii) one works out a revision in accordance with the requirements or conditions of adequacy as mentioned in the subsection above.

The first step of clarification is also Carnap's main aim when he distinguishes for the first time between two concepts of probability and speaks of an 'explication': [493]

> "It has been the chief purpose of this paper to explain and discuss the two concepts of probability in their role as explicanda for theories of probability. I think that in the present situation clarification of the explicanda is the most urgent task. When every author has not only a clear understanding of [her] own explicandum but also some insight into the existence, the importance, and the meaning of the explicandum on the other side, then it will be possible for each side to concentrate entirely on the positive task of constructing an explication and a theory of the chosen explicatum without wasting energy in futile polemics against the explicandum of the other

side." (Carnap 1945, pp.531f)

This step is crucial, because "when we criticize [...] an author, we must clearly distinguish between a rejection of [her] explicatum and a rejection of [her] explicandum" (cf. p.519). According to Carnap, a criterion for identifying different explicanda is the presence of a "multiplicity of [incompatible] phrases" between authors, which shows "that any assumption of a unique explicandum common to all authors is untenable" (cf. p.517).

However, the core of full-blown Carnapian explication lies in the second step and is more than only moderately revisionist in the sense described above: In our simplified extensional model of such full-blown explication, similarity is no longer a strict condition of conceptual revision, but only guiding in order to keep the initial and the resulting concept linked enough such that they can be considered to be still about the same topic. As we will see in our historical discussion below, Carnap and philosophers challenging his account tried to spell out such a constraint in extensional terms, suggesting a condition of sufficient core- and counter extensional overlap:

$$\underbrace{\text{big enough } E^A_+ \cap E^\Omega_+}_{\text{sufficient core extensional overlap}} \;\&\; \underbrace{\text{big enough } E^A_- \cap E^\Omega_-}_{\text{sufficient counter extensional overlap}} \qquad (3_a)$$

widened it to a condition of core- and counter extensional overlap:

$$\underbrace{E^A_+ \cap E^\Omega_+ \neq \emptyset}_{\text{minimal core extensional overlap}} \;\&\; \underbrace{E^A_- \cap E^\Omega_- \neq \emptyset}_{\text{minimal counter extensional overlap}} \qquad (3_b)$$

and modified it to a condition of core- and counter extensional structural equivalence:

$$\underbrace{\overset{\text{there is an isomorphism between}}{E^A_+, E^\Omega_+}}_{\text{core extensional structural equivalence}} \;\&\; \underbrace{\overset{\text{there is an isomorphism between}}{E^A_-, E^\Omega_-}}_{\text{counter extensional structural equivalence}} \qquad (3_c)$$

In our models of conceptual explanation and modest explication from above, the (first two) conditions of adequacy for explications were implemented as extensionally strict versions asking for a (complete) preservation of the original conceptual core and counter extension. In full-blown explanation, these conditions are, as we see here, weakened. [494] This enables full-blown explanation to become a strictly revisionary account: Conceptual development and revisions are not only about changes regarding the vagueness extension of concepts, but allow for serious changes of conceptual cores.

2.4 Conceptual Engineering

Coming to conceptual engineering now, one can observe that it generalises non-revisionary, modest, and full-blown explication even further, basically in all dimensions. First, regarding the domain, i.e. regarding the type of entities to be explicated, conceptual engineering aims not only at revising concepts and representational devices in general, but also networks of concepts (holism), whole theories, methodologies, and, according to some proponents, even the

world itself (cf. Cappelen 2018, chpt.12 on the worldliness of conceptual engineering). Since our discussion so far focussed on concepts, we take the expression 'conceptual' in 'conceptual engineering' literally and restrict our comparison to the classical realm of concepts.

Second, conceptual engineering aims at even further revision. As Cappelen (pp.11f 2018) puts it:

> "Carnap's notion of explication, however, is narrower than the activity I'm interested in. He recognizes only one kind of deficiency, 'inexactness'. Similarly, improvements for Carnap are also of a specific kind. An explication should be assessed along four dimensions: [ⓘ similarity, ⓘⓘ exactness, ⓘⓘⓘ fruitfulness, and ⓘⓥ simplicity. However,] Carnap does not *argue* for restricting the relevant deficiencies to inexactness and the relevant virtues to dimensions [ⓘ–ⓘⓥ]; he simply *states* this without argument."

According to the approach of conceptual engineering, in principle whatever serves as a standard for improvement, serves also as a condition of adequacy. We will discuss this generalisation in more detail in the next section. Here we focus on the similarity condition, because by performing serious revisions of a concept, one buys in the following problem, which was most-famously put forward by Peter F. Strawson when he criticised Carnap's method of explication (1963, p.505):

> "To offer formal explanations of key terms of scientific theories to one who seeks philosophical illumination of essential concepts of non-scientific discourse, is to do something utterly irrelevant – is a sheer misunderstanding, like offering a textbook on physiology to someone who says (with a sigh) that he wished he understood the workings of the human heart. [...] To do this last is not to solve the typical philosophical problem, but to change the subject."

This worry is one horn of the so-called *Cappelen dilemma* (cf. Cogburn 2019), which is as follows (cf. Cappelen 2018): It seems that one can either more or less simply account for conceptual revisions but has a hard time to maintain subject-relatedness of concepts; [495] or one has a more or less easy life with fixing the subject-relatedness of concepts, but has a hard time to account for conceptual change. E.g., an internalist meta-semantics (roughly: meanings are in the head) seems to generally allow for easier *changing* concepts by the help of, e.g., a speaker's or a community's changing her or its intentions of use; however, such a meta-semantics typically also has a harder time to relate such changing concepts to one and the same subject and topic. On the other hand, an externalist meta-semantics (roughly: meanings' just ain't in the head) can, at least at first glance, easier account for keeping concepts related to one and the same subject and topic, but have a harder time to account for an intentional change of concepts.

Now, the debate between Strawson and Carnap is exactly about this problem of subject- or topic-relatedness. The main question is: Given some *A*-

concept, what kind of guarantee do we have that a re-engineered Ω-concept is still about the same subject or topic? Without any similarity restriction, conceptual engineering could be easily trivialised: For any input A-concept and any purpose that is only achieved in a limited way by employing the A-concept, take any Ω-concept which is about the possibility of achieving the purpose (i.e. about a possible world in which the purpose is achieved), *et voilà!*, you have an improvement of the concept. For this reason, a general condition of similarity plays an important role – it needs to guarantee that the A-concept and the Ω-concept are about the same subject or topic.

The strict condition put forward in conceptual explanation and modest explication as discussed in the subsections above was that the core- and counter extension of the resulting concept (the *explicatum* with E^{Ω}_{+} and E^{Ω}_{-}) is a superset of the core- and counter extension of the initial concept (the *explicandum* with E^{A}_{+} and E^{A}_{-}). This might guarantee subject- or topic-relatedness of both concepts, but does not allow for (much of) a revision of the core (this is a particular instance of Cappelen's dilemma).

In general, explicating the similarity requirement has the problem that a too strict version does not allow for enough change between or revision of the concepts, and a too weak version does not guarantee enough subject- and topic-relatedness (this is another variation of Cappelen's dilemma in terms of a tension between the conditions of explication and conceptual engineering: similarity and fruitfulness). One way to approach this problem is to perform the strategy of linking subjects and topics to concepts, e.g., via a supervenience relation, which allows, e.g., that topics are more coarse-grained than extensions. So, although the extensions of concepts might differ, they can be still about the same subject or topic (cf. Cappelen 2018, chpt.10). Just to make the general role of similarity for conceptual engineering more clear, let us restate this condition as follows (note, what we put forward as a meaning postulate here is basically a hard to achieve result – [496] for a proof, see the more than 200-pages investigation centring around this problem of Cappelen 2018):

> The explicatum (Ω-concept) is to be *similar* to the explicandum (A-concept) in such a way that the A-concept and the Ω-concept are about the same subject/topic. ④ₐ

To briefly sum up, conceptual engineering is a widening of the full-blown approach of explication, allowing for any form of revision, elimination, and introduction that leads to some form of normative improvement of single or whole sets of concepts and representational devices in general (something with an intension and an extension). That such a revision is still about the same topic should be guaranteed by a similarity condition that consists in a constraint on subject- and topic-relatedness.

3 Conceptual Development and Carnap's Conditions of Adequacy

In the previous section, we have sketched four models of conceptual development. We have also indicated already that these models basically result from a weakening of general conditions of adequacy for conceptual development. In particular, we think that the development of the models can be framed as a weakening of the already mentioned four conditions of adequacy put forward by Carnap in his *Logical Foundations of Probability* (cf. 1950/1962, §3,p.7):

> ⓘ "**[Similarity:]** The explicatum is to be *similar to the explicandum* in such a way that, in most cases in which the explicandum has so far been used, the explicatum can be used; however, close similarity is not required, and considerable differences are permitted.
>
> ⓘⓘ **[Exactness:]** The characterization of the explicatum, that is, the rules of its use (for instance, in the form of a definition), is to be given in an *exact* form, so as to introduce the explicatum into a well-connected system of scientific concepts.
>
> ⓘⓘⓘ **[Fruitfulness:]** The explicatum is to be a *fruitful* concept, that is, useful for the formulation of many universal statements (empirical laws in the case of a nonlogical concept, logical theorems in the case of a logical concept).
>
> ⓘⓥ **[Simplicity:]** The explicatum should be as *simple* as possible; this means as simple as the more important requirements [ⓘ, ⓘⓘ, and ⓘⓘⓘ] permit."

Carnap did not come up with these conditions from scratch. Rather, he saw Karl Menger as a methodological forerunner to the project of explication. Below we will argue that, in fact, Menger's account fits to the model of conceptual explanation and modest explication. But before we come to this utilisation of the models for our historical investigation, we want to make the relation between the conditions of the four models explicit. [497]

Conceptual Explanation. Let us begin with conceptual explanation. As stated above, our model of conceptual explanation puts forward a combined condition of adequacy: in shifting from an initial A-concept to a resulting Ω-concept, our grasping of the concept's extension is ⓘₐ at least preserved regarding all types of extensions and ⓘᵦ improved regarding at least one type of extension. The extensions of the concept are maximally similar inasmuch as the extensions themselves do not change ($E^A_+ = E^\Omega_- = E_+$ etc.). In this sense, conceptual explanation amounts to putting forward the most strict form of an extensional similarity condition ⓘ, namely a condition of extensional identity. Exactness ⓘⓘ, fruitfulness ⓘⓘⓘ, and simplicity ⓘⓥ are also relativised to our grasping of concepts and do not directly affect their extensions.

Modest Explication. Coming to modest explication, we have seen that (2a) the similarity constraint is about core- and counter extensional correctness but allows for changes in a concept's extension. In this sense, the similarity condition in the vein of (i) is weakened from extensional identity to some form of conservative or modest extensional revision. Also exactness (ii) was interpreted as an extensional condition, allowing for (2b) the extensional reduction of vagueness. Fruitfulness (iii) and simplicity (iv) are not modulated in a particular way by shifting from conceptual explanation to modest explication.

Full-Blown Explication. Full-blown explication allows for stronger forms of revisions: In the more restricted form, it demands (3a) a big enough overlap of the initial (A) and the resulting (Ω) concept's core- and counter extensions. So, non-conservative shifts in the conceptual core are permitted, however, such shifts are exceptional and not default. An even stronger form of revision allows for (3b) changes in the conceptual core that are not only exceptions, but concern even default cases. Similarity in this sense asks only for a minimal overlap of the extensions. Finally, full-blown explication constrained by (3c) extensional structural equivalence only is in some sense more permissive inasmuch as there is no need of any overlap of the extensions at all – we will see examples of this in the next section. In another sense it is more restrictive inasmuch as the structure is supposed to be preserved under conceptual changes, which is something that is demanded neither by (3a) nor by (3b). All in all, (the second step of) full-blown explication concerns particularly a weakening of the similarity requirement (i) from the modest condition of modest or conservative explication towards a more revisionary form. Again, fruitfulness (iii) and simplicity (iv) are not modulated in a particular way.

Conceptual Engineering. We now want to argue that a further weakening of the constraints of model (3) of full-blown explication leads quite naturally to model (4) of conceptual engineering. [498] In the previous section, we have outlined already that one account of conceptual engineering, namely that of Herman Cappelen, suggests to overcome the problem of topic-relatedness of conceptual revisions by the help of a supervenience reconstruction: topics of a concept supervene on the extensions of a concept, which means that in principle one can have changes in extensions without changes in the topic. We have stated already that conceptual engineering in this vein puts forward (4a) as a similarity condition for topics. Since topics supervene on extensions, this means that such a similarity condition is even more permissive for changes in the extension. In this sense, the general similarity condition (i) is weakened from extensional identity (conceptual explanation) via modest extensional revision (modest explication) and full-blown extensional revision (full-blown explication) towards any form of extensional revision that keeps up with topic-relatedness (conceptual engineering).

It seems that also regarding the other adequacy conditions a similar tendency of weakening can be recognised. One can concede that Carnap's revi-

sionary approach focused on conceptual improvement in terms of exactness. However, although in some contexts we might think that (ii) exactness and (iv) simplicity are counterproductive (think, e.g., on a legal context where vagueness might be very useful for the application of a law, or a rhetorical context where complexity might be very useful for swamping alternative opinions), it seems that exactness and simplicity are quite general features we very often strive for when employing concepts; in this sense, it seems natural to consider the Carnapian conditions as valid under a *ceteris paribus-clause*: Also for conceptual engineers, ceteris paribus (ii) exactness holds and ceteris paribus (iv) simplicity holds.

Finally, coming to fruitfulness, again, although Carnap's revisionary approach focused on conceptual improvement in terms of exactness, it does not exclude putting forward other ends than increasing exactness. Rather, it seems that in the vein of Carnap's revisionary approach, (iii) fruitfulness should have a wider reading in terms of an instrumental interpretation in the sense that whatever is a purpose of a user of language or a wider language community that can be met by employing one concept, let us say the Ω-concept, better than by employing another concept, let us say the A-concept, can be considered to rationalise the choice of opting for the Ω-concept vs. the A-concept. Since Carnap was interested in revising concepts of science (e.g. *testability*, *probability*, *confirmation*, etc.) and revising them for the purpose of scientific theory-building, he put forward as fruitfulness-benchmark the performance regarding formulating scientific statements and theories. However, in the wider reading, if one aims at a different purpose, then, of course, the degree of how well the other purpose is satisfied should serve as a benchmark. E.g., if the purpose is not scientific theory building, but, e.g., that of making professional exclamations of taste, one might easily aim at engineering and employing descriptors like 'complex', 'buttery', etc., which serve purposes of wine taste culture better than purposes of science. [499] So, our suggestion is to apply the following wider reading to the fruitfulness-requirement and amend the model of conceptual engineering by the following condition:

> The explicatum, i.e. the Ω-concept, is to be a *fruitful* concept, that is, useful for the purpose at hand; at least more useful than the explicandum, the A-concept, was for this purpose. (4b)

With this framing of how the four models of conceptual development can be seen in a trajectory of weakening the Carnapian conditions of adequacy, we want to put some "historical flesh" on our investigation and show that not only the theoretical models, but also Carnap's account of explication and its forerunners can be put in such a trajectory.

4 Carnap's Methodology: From Conceptual Explanation To Full-Blown Explication

In this section, we argue that in fact Carnap's methodology is aligned with our models of conceptual development as a form of weakening from conceptual explanation (forerunners) via modest explication (*Aufbau* and *Logical Syntax*) towards full-blown explication (*Logical Foundations of Probability* and *Schilpp-Replies*).

4.1 Rational Reconstruction as Conceptual Explanation or Modest Explication

We think that one can attribute conceptual explanation particularly to predecessors of Carnap's account of rational reconstruction and explication. Among them are, e.g., Kant and Husserl. Carnap claims, e.g., about Husserl:

> "Husserl, in speaking about the synthesis of identification between a confused, nonarticulated sense and a subsequently intended distinct, articulated sense, calls the latter the 'Explikat' of the former." (Carnap 1950/1962, p.3)

We take the expressions "confused" and "nonarticulated" to support an intensional reading, and as we have seen above, the focus on the intensional component of a concept, namely the way we grasp a concept's extensions, is characteristic for model ① of conceptual explanation.

Next to Husserl, Carnap refers also to Kant in his characterisation of 'explication' (cf. 1950/1962, p.3), and states that 'explication' in Kant's sense means to find the predicates that are 'contained' in the subject concept. We consider this "finding" also as supporting the intensional reading and by this indicating a case of conceptual explanation. [500]

That forerunners of Carnap's account of explication are forms of conceptual explanation gives reason to think that also his early account is in this vein. In the following, we argue that this is indeed the case.

According to the *Aufbau*, the aim of philosophy (of science) is to rationally reconstruct scientific and pre-scientific concepts in the sense of providing explicit definitions for them on the basis of a small set of, e.g., phenomenologically fundamental concepts such as *elementary experience* and *recollection of similarity*. In the *Aufbau* itself, Carnap does not speak of 'explication', but of 'rational reconstruction'. But in his preface to the second edition from 1961, he links the approach of rational reconstruction to explication and describes it as follows:

> "By rational reconstruction is here meant the searching out of new definitions for old concepts. The old concepts did not ordinarily originate by way of deliberate formulation, but in more or less unreflected and spontaneous development. The new definitions

> should be superior to the old in clarity and exactness, and, above all, should fit into a systematic structure of concepts. Such a clarification of concepts, nowadays frequently called "explication," still seems to me one of the most important tasks of philosophy, especially if it is concerned with the main categories of human thought." (Carnap 1928/2003, p.v)

Also in another passage of the preface Carnap basically identifies the methodology of logical reconstruction of the *Aufbau* with the methodology of explication:

> "The first version was written in the years 1922-1925. When I read the old formulations today, I find many a passage which I would now phrase differently or leave out altogether; but I still agree with the philosophical orientation which stands behind this book. This holds especially for the problems that are posed, and for the essential features of the method which was employed." (Carnap 1928/2003, p.v)

Though Carnap explicitly states that he disagrees with parts of his former approach, particularly the last sentence makes clear that he subscribes to the view of a methodological continuation. Still, one can ask what the exact differences between rational reconstruction of the *Aufbau* and explication of *Logical Foundations of Probability* are. Carus (2007, pp.23ff) sees a difference between the methodology of rational reconstruction and explication in a widening of the latter regarding the choice of the underlying background logic or linguistic framework, which comes with Carnap's formulation of the *principle of tolerance* of his *Logical Syntax*. However, we want to argue here that there is also another important difference. Whereas the methodology of *Logical Foundations of Probability* is about *full-blown* explication, rational reconstruction of the *Aufbau* is about conceptual explanation or a *modest* form of explication. In the following we provide six arguments for this claim. [501]

1) The method of rational reconstruction was first labeled as such in Carnap's *Aufbau* (cf. Beaney 2013, p.237). One reason why we think that rational reconstruction can be described as a case of conceptual explanation or modest explication is based on the way Carnap refers to his conditions of adequacy in his later description of the project of the *Aufbau*. It is interesting to note that one finds an explicit reference only to two of the four general conditions for the adequacy of explications in Carnap's preface to the second edition of the *Aufbau* as quoted above (p.v): His claim that "new definitions should be superior to the old in clarity and exactness" refers to the condition of exactness (ii), and his claim that, "above all, [they] should fit into a systematic structure of concepts" refers to the condition of fruitfulness (iii). One might wonder why he did not explicitly refer to the similarity requirement (i) and the simplicity requirement (iv). Regarding the latter, we saw already in the formulation above that it is more or less optional; at least it is not prioritised in case of a conflict with the other requirements. Regarding the former, one reason might be that

for Carnap with the project of the *Aufbau* the question of similarity did not pop up, because the old and the new notions were anyhow supposed to be similar in the sense of being extensionally equivalent. As we have seen in the quotes of the preface above, he claims that rational reconstruction is about the search for "new definitions for old concepts" (cf. Carnap 1928/2003, p.v). The extensions of the concepts remain the same, but the way they are given to us, the way we grasp them, the intensions of the concepts, their definitions, differ.

2) We think that this interpretation of the project of the *Aufbau*, namely that it is more about getting the definitions right, but not about the concepts/the extensions – they are what we want to *re*construct correctly –, is also backed up by his claim that:

> "In constructing similarity circles and quality classes, we must pay especial attention to the fact that the construction does not have to reflect the actual process of cognition, but that it is only a rational reconstruction which must lead to the same result." (Carnap 1928/2003, p.133)

We interpret the "same result" as being about extensional equivalence, so, complete similarity in the sense of our models on conceptual explanation and modest explication seems to be presupposed. That reconstructions need not, and in fact even should not, always reflect the way we actually cognise makes up for the core task of rational reconstruction, since it is exactly this difference that allows us to avoid pitfalls of "unreflected and spontaneous" thinking.

3) That the *Aufbau* is about conceptual explanation and modest revision only, is also confirmed by the way its "revisionary" programme is employed. [502] For Carnap, one important philosophical application of his constitution theory is the analysis of philosophical concepts and problems. Particularly his *Elimination of Metaphysics Through Logical Analysis of Language* (1931) is, in the end, not about improving philosophical concepts, but about their elimination. By learning that many philosophical problems and concepts, which sometimes even go back to antiquity, are external, pseudo-scientific, pseudo-concepts, based on category mistakes or empty due to their logical structure, for Carnap the final philosophical work simply consists in abandoning them:

> "What, then, is left over for philosophy [... is that] it serves to eliminate meaningless words, meaningless pseudo-statements. [...] It is the indicated task of logical analysis, inquiry into logical foundations, that is meant by "scientific philosophy" in contrast to metaphysics." (Carnap 1996, p.77)

To learn that a philosophical concept is empty is basically an insight from conceptual analysis in the sense of conceptual explanation.

4) Now, there are other reasons why we think that rational reconstruction is mainly about conceptual explanation or modest explication. So, e.g., if we think about a key method of the *Aufbau*, namely that of quasianalysis, one can see that its main criticism is about the failure of getting the extensions right.

Here is how this argument goes (our discussion is based on the summary provided by Leitgeb and Carus 2020, Supplement D. Methodology): In the *Aufbau*, Carnap tries to rationally reconstruct the formation of sensual qualities by the help of quasianalysis. The method is an extension of Frege's method of defining equivalence classes on the basis of an equivalence relation. An equivalence relation is any relation that is reflexive, symmetric, and transitive. An equivalence class with respect to such a relation is the maximal class of all objects that stand in this relation to each other. Equivalence classes form a partition, which means that they are disjoint and mutually exhaustive. By the help of the method of forming equivalence classes, Frege was able, e.g., to "rationally reconstruct" the natural numbers as equivalence classes of equinumerous classes: 0 is the class of all classes that are equinumerous to the empty class (i.e. $\{x : x \neq x\}$), 1 is the class of all classes that are equinumerous to the class containing only 0 (i.e. $\{x : x = 0\}$), etc. Now, Carnap wanted to provide a rational reconstruction of sensual qualities in the same spirit. His framework operates on a similarity relation between elementary experiences, which can be basically understood as multidimensional spaces combining momental sensual (optical, auditory, haptic, etc.) experiences. However, though similarity is reflexive – any x is similar to x – and symmetric – if x is similar to y, then y is similar to x –, it is not transitive: It might be that x is similar to y and y is similar to z, but x is not similar to z. The reason for this is that "minor differences [...] may add up". [503] The method of quasianalysis tries to deal with this by expanding the method of forming equivalence classes to one of forming so-called *similarity circles*. A similarity circle with respect to a similarity relation is the maximal class of pairwise similar objects. This way defined, similarity circles are, like equivalence classes, exhaustive, but, unlike equivalence classes, not disjoint, so, two similarity circles with respect to a similarity relation might overlap. Quasianalysis by the help of forming similarity circles works well, e.g., if one wants to rationally reconstruct qualities A and B in case that, e.g., objects (elementary experiences) a_1, a_2, a_3 are pairwise similar (with respect to quality A) and $b_1, b_2, b_3 = a_3$ are pairwise similar (with respect to quality B): The classes $A = \{a_1, a_2, a_3\}$ and $B = \{b_1, b_2, b_3\}$ are the maximal classes of pairwise similar objects, so they are similarity circles that overlap in b_3/a_3 and can be interpreted as the qualities A and B. However, it fails, e.g., if we want to perform such a reconstruction for a system where next to A and B there is also (and only furthermore) quality C manifested in a similarity between $c_1 = b_1, c_2 = a_2, c_3$. In this case, not only A, B, and $C = \{c_1, c_2, c_3\}$ with an overlap of A and C in c_2/a_2 and A and B in c_1/b_1 result as similarity circles, but also $D = \{b_1 = c_1, a_2 = c_2, a_3 = b_3\}$ forms a maximal class of pairwise similar objects, which amounts to a new quality D that is not in the original system under consideration. Quasianalysis leads to an incorrect result: The notion of a *sensual quality* with which we start is not extensionally equivalent with the notion of *sensual quality* as rationally reconstructed. Goodman (1951, chpt.V) was one of the first to clearly formulate and stress this problem. What is of most importance for our argumentation is that this criticism is about extensional correctness of the reconstructed notions. So, an important criticism

of Carnap's approach in the *Aufbau* is about extensional similarity or even extensional equivalence as outlined in our models of conceptual explanation and modest explication. It is not about an inadequate revision of concepts.

5) Another fact confirming our claim that the methodology of the *Aufbau* was one of conceptual explanation and modest (and not full-blown) explication is that in the tradition, in which Carnap sees his project, these two forms play also a prominent role. An important reference of Carnap to Frege concerning the way he locates himself within the tradition is the following one:

> "Through the influence of Gottlob Frege, under whom I studied in Jena, [...] I had realized [...] the fundamental importance of mathematics for the formation of a system of knowledge [...]. These insights formed the basis of my book." (cf. Carnap 1928/2003, p.vi)

and

> "The first exact explications for the ordinary arithmetical terms have been given by G. Frege and later in a similar way by Bertrand Russell." (Carnap 1950/1962, p.17)

[504] It might be the case that one needs to work with a notion of similarity in the sense of a structural/isomorphic extensional equivalence in order to imbed Frege's logical reconstruction of mathematical concepts into the model of conceptual explanation or modest explication – this will definitely depend on one's view about what one considered as numbers in the first place. However, there are many other cases in which Frege's and Russell's reconstructions can be clearly considered as modest revisionary. A case in point is, e.g., Frege's and Russell's treatment of definite descriptions that we already mentioned above. It seems clear that, e.g., an analysis of 'The present King of France is bald.' (which starts with E_o^A regarding the notion of *truth*) as false (ending in E_-^Ω regarding the notion of *truth*) is modestly revisionary only, because, as Russell would say, its contextual analysis brings this to the fore, or, as Frege would suggest, the stipulated assignment of 'the present King of France' to the empty class simply determines the truth value this way: that the empty class is bald is a simple falsehood. To put it briefly: Also the tradition in which Carnap puts himself reconstructions are not radically but only modestly revisionary.

Also in another tradition Carnap puts himself into (this time, however, only at the later stage of his *Logical Foundations of Probability*, cf. p.7), we find a formulation of conditions for definitions and concept formation that is very close to our understanding of the methodology of Carnap in the sense of a modest explication. So, e.g., Menger (1943, p.4) states:

> "A good definition of a word must include all entities which are always denoted and must exclude all entities which are never denoted by the word. [...] A good definition should extend the use of the word by dealing with objects not known or not dealt with in ordinary language. With regard to such entities, a definition cannot

> help being arbitrary. [... However, this arbitrariness is constrained, because] a good definition must yield many consequences, in particular theorems which are aesthetically satisfactory by their generality and simplicity, and theorems connecting the defined concept with concepts of other theories."

The first part of the quote is more than only reminiscent of the conditions of our model of modest explication ②.

6) Finally, one can find the modest revisionary attitude also in a reconstruction of Carnap's further development of the programme of the *Aufbau* in the early and mid 1930s. So, e.g., in his *Testability and Meaning* (1936 and 1937) he performs a methodological investigation of how to reconstruct, reduce or link concepts not only by the help of explicit definitions, but also by so-called *bilateral reduction sentences*, which are, technically seen, particular forms of *creative* conditional definitions or *creative* meaning postulates. The main idea is that by the help of such bilateral reduction sentences, one is able to reconstruct dispositional concepts of science. In particular, dispositions are reconstructed by linking them to test- and manifestation conditions. [505] In contrast to a reduction by the help of an explicit definition – such a reduction results in a concept with only a core- and counter extension (E_+ and E_-) –, bilateral reduction sentences bring about vagueness in the sense that objects that are not tested are also not assigned to one of E_+ and E_- (so they land in the vagueness extension E_o). However, as the Carnapian programme of *Testability and Meaning* suggests, this inexactness or vagueness can be reduced by putting forward further test- and manifestation conditions, which will cover a broader range of objects and by this reduce E_o of a concept. Again, for our purpose it is important to see that the extension of this programme is still in the vein of conceptual explanation or modest explication. The conceptual revision is only about reducing inexactness, but not about revising a concept at its core.

To briefly sum up: Rational reconstruction of concepts is conceptual explanation or modest explication. The reasons for this are that 1) for Carnap the question of non-conservative or non-modest core extensional dissimilarity does not pop up in his later description of the project of the *Aufbau*; 2) that he stresses extensional equivalence; 3) that the prominent philosophical application of his project consists in the elimination, but not the revision of concepts; 4) that the criticism of his key method of quasianalysis is about its failure to account for strict core- and counter extensional similarity; 5) that the tradition he locates himself into is about conceptual explanation or modest explication; and that 6) also the continuation and expansion of his project, e.g., in *Testability and Meaning* is about a modest explication.

4.2 Towards Full-Blown Explication

Above we have stated already that full-blown explication consists of two steps and that its core lies in the second step and is more than only moderately revisionist in the sense described above. Now, also the more severe revisionist

account of Carnap underwent some development. In our model of full-blown explication, we have put forward three different conditions of adequacy with respect to similarity: (3a)–(3c). Now, these forms are motivated by Carnap's development of his account of full-blown explication. As we saw in the quote of his conditions above, according to the formulated similarity condition (i) in fact not all clear-cut cases need to be preserved, but only "most [such] cases". This amounts to condition (3a).

It is interesting to note that later in his *Replies* (1963) he generalised this constraint even further and demanded not preservation of "most cases", but the preservation of "some cases", i.e. an overlapping of E^A and E^Ω. This amounts to condition (3b).

Even this weak constraint was contested by authors like Goodman (1951/1977, chpt.1) in the sense that one might want to say that, e.g., the set-theoretical approach to numbers or geometry amounts to an explication, [506] although there might be no overlap between the input (numbers, points) and the output (sets). For this reason, Goodman (1951/1977) proposed as a similarity requirement the existence of an isomorphism between the extensions. This corresponds to condition (3c). However, a problem of such a natural development is that structural equivalence by the help of an isomorphism amounts only to a cardinality claim linking two extensions, and that, e.g., there is only one *current president of the United States* and only one *even prime number* clearly does not imply that these are similar concepts (for an overview of the weakening of the similarity requirement and how Goodman's and Carnap's approach are linked to each other, cf. Brun 2020).

Regardless of the exact formulation of the similarity constraint one puts forward for the endeavour of explication, it is easy to see that also in the case of full-blown explication, Carnap's conditions for explication were still guiding and that there was a tendency of weakening. We think that particularly on the basis of his statements in the *Aufbau* (1928/2003), the *Logical Syntax* (1934/2001), the *Two Concepts of Probability* (1945), *Meaning and Necessity* (1947), *Logical Foundations of Probability* (1950/1962), and his *Replies and Systematic Exposition* in the Schilpp volume on his philosophy (1963), one can sketch the following cornerstones of Carnap's methodological development from conceptual explanation to full-blown explication:

- *Aufbau*, 1928/2003: first implicit large-scale employment of the methodology of rational reconstruction (which is, as we have argued above, conceptual explanation and modest explication)
- *Logical Syntax*, 1934/2001: first transition from rational reconstruction to explication (according to Carus 2007, pp.23ff, explication is basically rational reconstruction with tolerance regarding the logical background theory)
- *Two Concepts of Probability*, 1945: first usage of the term 'explication' with a focus on the importance of its methodological first step, namely to initially clarify the notion in need of an explication (the *explicandum*)

- *Meaning and Necessity*, 1947: first focus on putting forward specific content-related conditions for the adequacy of explicated notions (such as his formulation of *convention 2-1*, p.10)
- *Logical Foundations of Probability*, 1950/1962: first time to indicate a metatheory of explications by stating the two-step procedure and the formulation of general conditions of adequacy for explications
- *Replies and Systematic Exposition (Schilpp volume)*, 1963: first time extension of the methodology allowing explicitly also for more general target-frameworks such as natural language etc. [507]

5 Conclusion

We have argued that the history of transformative analysis can be framed as a generalisation of the Carnapian conditions for explications. It ranges over conceptual explanations, which allow for no transformation in the extension of concepts, but only in the way we grasp them; to modest explications, which aim at preserving a conceptual core while at the same time reducing inexactness or vagueness; via full-blown explications, which allow for weaker forms of similarity to the advantage of better purpose-suitability; and, finally, to conceptual engineering, which is about any form of conceptual improvement. Generalisations of the Carnapian conditions play not only a role in the development of Carnap's methodology, but are also guiding for contemporary accounts of conceptual engineering inasmuch as the exactness and the simplicity condition are *ceteris paribus* important features of any conceptual analysis; the fruitfulness condition is simply an instrumental means-ends principle stating that whenever one puts forward a particular purpose, instrumentality of a conceptual tool for achieving that purpose makes up for a condition of adequacy; and, finally, the generalised similarity condition aims at keeping up subject- and topic-relatedness also for the revised concept. Putting forward the latter two generalised conditions is particularly relevant for conceptual engineering due to Cappelen's dilemma, which states that the aim for change and that for topic-relatedness in general run counter each other.

After we have outlined the models of conceptual development, we have argued that Carnap's account can be reconstructed as a development within the first three models of conceptual explanation, modest explication, and full-blown explication, where the methodology of rational reconstruction of his *Aufbau* falls under the first two models, and the methodology of explication of his *Logical Foundations of Probability* falls under the third model of full-blown explication.

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