

CONCERNING ANALYSIS OF GESTALT CONCEPTS BY KURT GRELLING AND PAUL OPPENHEIM

Abraham S. Luchins and Edith H. Luchins

For many years we have been preparing a biography of Kurt GRELLING (1886-1942), a philosopher, logician, and mathematician. The biography also touches on the lives of Paul OPPENHEIM (1885-1977), and of Carl G. HEMPEL (1905-1997), philosophers of science. They both tried to rescue GRELLING from Nazi Europe. It also serves as an introduction to the times in which they lived. The biography is scheduled to appear in a subsequent issue of *Gestalt Theory*.

When Hitler came into power, the OPPENHEIMS fled in 1933 from Frankfurt, his native city, to settle in Brussels, where his wife was born. The HEMPELS hastily departed Berlin in 1934 for Brussels where he worked as OPPENHEIMS paid assistant. GRELLING left his native city Berlin in 1937 and again in 1938 to replace HEMPEL who had emigrated to the U.S.A. While in Brussels, GRELLING and OPPENHEIM collaborated on several reports, among them the one published herein, which was written in English.

The present issue presents:

- Overview of the paper *The Logical Analysis of "Gestalt" as "Functional Whole"* and related papers.

- *The Logical Analysis of "Gestalt" as "Functional Whole,"* by GRELLING and OPPENHEIM, printed essentially as in the typescript sent to us by Paul OPPENHEIM in 1971 [with our few insertions in square brackets].

- Comments on a recent article by Max VISSER, *The Organizational Gestalt. Images of Organization Revisited (Gestalt Theory, 19(4), 1997, pp. 231-240)*, which referred to GRELLING and OPPENHEIM and to their *functional whole* paper.

Acknowledgements

We are greatly indebted to Lorraine PISARCZYK, Administrative Secretary of the Department of Mathematical Sciences of Rensselaer Polytechnic Institute, for her patience and skill in retyping the paper on "'Gestalt' as 'functional whole'" by Kurt GRELLING and Paul OPPENHEIM, and in typing the present reports as well as the biography of GRELLING to be published in a subsequent issue. There we will thank the many people to whom we owe a debt of gratitude for their assistance. Here we want to mention that we first heard about the work of GRELLING and OPPENHEIM in Max WERTHEIMER's seminars at the New School for Social Research in New York City in the mid-and late-1930s. Almost three decades later

we learned of GRELLING's fate - not in details, but in broad strokes - during an extensive interview with the OPPENHEIMS, in which HEMPEL also participated. In recent years we received helpful information from Volker PECKHAUS; Claude GRELLING, Kurt GRELLING's son; and Felix OPPENHEIM, Paul OPPENHEIM's son. We also thank Gerhard STEMBERGER for encouraging the publication of these reports.

From 1969 to 1975 we published in *Methodology and Science* a series of translations and reviews of GRELLING's undated manuscripts (some unfinished) that were provided by OPPENHEIM. The translator of most of the manuscripts was Kurt BING, Professor Emeritus of Mathematical Sciences at Rensselaer Polytechnic Institute. We were saddened to learn that he died on 24 September 1997 as we were preparing these reports.

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Abbildung: Kurt GRELLING in his garden in his Berlin home.



Abbildung: Dr. Paul OPPENHEIM (courtesy of his son Prof. Felix OPPENHEIM)

OVERVIEW OF " 'GESTALT' AS 'FUNCTIONAL WHOLE' " AND RELATED PAPERS

Abraham S. Luchins and Edith H. Luchins

On Receiving the Typescripts

Shortly after the interview with Paul OPPENHEIM [mentioned in the Acknowledgements], he sent us several of GRELLING's unpublished and undated typescripts in German, some unfinished, which with the help of colleagues we translated, edited, and published in the journal *Methodology and Science*.¹ On 13 May 1971, OPPENHEIM wrote to thank us for reprints of the translations and reviews of GRELLING's papers and to express his satisfaction that the publications were honoring the memory of his close friend and collaborator. The letter continued:

"I do not remember having mentioned to you the following paper: Logical Analysis of 'Gestalt' as 'Functional Whole' by Kurt GRELLING (Brussels) and Paul OPPENHEIM (Brussels). It had been accepted by the *Journal of Unified Science [Erkenntnis]* for publication in its Volume 8 [1938/1939]. Unfortunately, due to the political unrest in Germany, the paper was not published in Volume 8 but only its title on page 370.² If I have not yet drawn your attention to this article, the reason surely has been that GRELLING is not its sole author. On the other hand, I remember that GRELLING had hoped very much that it

¹ Translated by Kurt BING and Edith H. LUCHINS were GRELLING's typescripts: On Definitions by Equivalence Classes and by Group Invariants, *Methodology and Science*, 2, 1969, pp. 116-122; and On the Logical Relations Between Groups and Equivalence Classes, 3, 1970, pp. 5-17. Possibly of special interest to readers of *Gestalt Theory* may be a 15 page typescript by GRELLING, with an edited translation by Abraham S. and Edith H. LUCHINS: 1. Main Part: "Melody as Gestalt," 8, 1975, pp. 13-23, reviewed by us as: On GRELLING's "Melody as Gestalt": Comparison of EHRENFELS' and WERTHEIMER's Viewpoints, 8, pp. 1-8; also reviewed by Steven CELLUM and Edith H. LUCHINS as: GRELLING's "Melody as Gestalt": A Musical Review, 8, pp. 9-12.

² The philosopher and logician Ernest NAGEL, who reviewed GRELLING's paper on dependence and the functional whole paper, wrote that they were reprinted for members of the Fifth International Congress held in Cambridge, Mass., 1939, "from the *Journal of Unified Science [Erkenntnis]*, Vol. 9. This volume of the Journal was a casualty of World War II and has never been published" (*The Structure of Science: Problems in the Logic of Scientific Explanation*, Harcourt, Brace & World, New York, 1961, p 349n). It is likely that the manuscripts were originally scheduled for inclusion in Volume 8, which is referred to in OPPENHEIM's 1971 letter, and also cited in Footnote 1 on the third page of the functional whole paper as the volume in which GRELLING's dependence article was to appear, and that they were later assigned to the ill-fated Volume 9. GRELLING's paper, "A Logical Theory of Dependence," was then rescheduled to appear in *Erkenntnis*, 9, 37-45, and the paper by GRELLING and OPPENHEIM, "Logical Analysis of 'Gestalt' as 'Functional Whole,'" in *Erkenntnis*, 9, pp. 70-76. Our copy of GRELLING's dependence paper has *Erkenntnis* stamped on it but has no date or volume number.

would be published; and I understand the importance he attributed to it. ... no translation would be necessary since it has been written in English."

OPPENHEIM sent us the manuscript published in the present issue. This fulfills the wish of both GRELLING and OPPENHEIM that the paper appear in a scientific journal. *Gestalt Theory* is most appropriate. The paper is of particular interest to Gestalt psychologists because of its treatment of "Gestalt" as "functional whole." The functional whole paper may be even more timely than when originally written, in light of the current interest in GRELLING and OPPENHEIM and in analysis of the concept of Gestalt.

NAGEL's Reviews

Preprints of the paper on Gestalt as functional whole were distributed in 1939 at the Fifth International Congress for the Unity of Science at Harvard University but not read. Similarly distributed but not read at the same Congress was a related paper on dependence, also written in English, authored by GRELLING. He had originally planned to attend the Congress at Harvard University (and had been urged to do so by Otto NEURATH, a leader of the Vienna Circle). But GRELLING did not receive by June 1939 the necessary travel visa (perhaps because of difficulties in establishing his "Aryan" status, difficulties that had prevented his attending the Congress in Paris two years earlier). Uncertain about whether he would receive the visa, and worried about the expenses and whether the trip was worthwhile, he abandoned his plans. Had he received the visa, which was unlikely, and had he attended the Congress in 1939, he might have read or discussed both papers - and possibly altered his fate. That same year both papers were reviewed as follows by Ernest NAGEL³:

Kurt GRELLING. *A logical theory of dependence*. Preprinted for the members of the Fifth International Congress for the Unity of Science, Cambridge, Mass., 1939, 9 pp. Distributed to members of the Congress but not read.

This paper attempts to state precisely the logical structure of the concept of dependence as used in such contexts as "Price depends on supply and demand." Whatever is said to depend on something else is a function, while what it depends on is in general a class of functions. Dr. GRELLING finds it necessary, however, to distinguish between several senses of "dependence." One of them, called *equidependence*, holds between a function f and a class of functions ϕ in the following case: If every function belonging to ϕ takes the same values for every pair of arguments x_1 and x_2 , then f itself must take equal values for x_1 and x_2 . A second, called *variable dependence*, holds between a function f and a class of functions ϕ in the following case: If a single function belonging to ϕ takes different values for every pair of arguments x_1 and x_2 , then f itself takes different values for those arguments. Formal definitions are supplied for these notions, and other cognate distinctions, e.g., independence and interdependence, are defined in terms of them.

³ NAGEL's reviews appeared in *The Journal of Symbolic Logic*, IV, 1939, pp. 168-170.

Kurt GRELLING and Paul OPPENHEIM. *Logical analysis of "Gestalt" as "functional whole."* 7 pp. [See previous review.]

This paper ties up with an earlier paper⁴ by the present authors as well as with the preceding paper by GRELLING. Employing the previously defined notion of dependence, the present paper outlines an analysis of Gestalt in the sense of functional whole, and suggests how the analysis is relevant for discussing the difference between aggregative and complex wholes, often illustrated in the literature of Gestalt psychology.

Our Review

The earlier paper by GRELLING and OPPENHEIM, hereafter referred to briefly as the new logic paper, distinguished between two essentially different meanings of the term "Gestalt." It defined the *Gestalt* (of a complex with respect to a correspondence) as *the invariant of transpositions* (of the complex with respect to the correspondence). In the language of mathematical logic, it defined Gestalten as: *the equivalence classes of correspondences*. It analyzed the term Gestalt in its original sense of "shape," "form," or "configuration." Their present paper analyzed the term Gestalt in its meaning of "functional (or organized) whole" or "dynamic unity." Noting that most modern Gestaltists ascribed the property of "interdependence" to such wholes, GRELLING and OPPENHEIM based this concept on the more fundamental concept of dependence (as characterized in GRELLING's paper). Also based on dependence was their definition of "independence," characteristic of aggregative or summative wholes as contrasted with functional wholes. They mentioned that through introduction of the notion of probability, interdependence and independence may be regarded as the two poles of a serial order. Strict interdependence occurs when the whole is determined by any part, when all elements depend on every element. An example is the construction of an entire animal skeleton from one bone. [Although not mentioned in the paper, a mathematical analogue is that of an analytic function whose behavior in the large is determined by its behavior along any arc, no matter how small.]

GRELLING and OPPENHEIM also defined a system and a "dependence system." They noted that the previous joint paper had introduced the expression "determinational system" (*Wirkungssystem*) for "functional whole," using the so-called thing-language of everyday life. In the present paper they employed the so-called world-lines language to define "determination system." They referred to a selective class of world-lines. [A mathematical analogue of a selective class is an equivalence class, a concept cited above (in the definition of Gestalten), which is

⁴ Their earlier joint paper was referred to by GRELLING and OPPENHEIM in the functional whole paper as follows: Der Gestaltbegriff im Lichte der neuen Logik, *Erkenntnis*, vol. 7, p. 211-225, and p. 357-359. (The date of Volume 7 was not given but is variously taken as 1937, 1938, or 1937/1938.) The second sequence of pages came from a manuscript by GRELLING and OPPENHEIM in English: "Supplementary Remarks on the Concept of Gestalt"; it is sometimes considered a separate paper, e.g., in SMITH's book, mentioned in Note 7.

central to several of GRELLING's manuscripts on mathematical logic (see Note 1.)] They concluded that the two concepts of dependence system and determination system can both be designated by the term "functional whole," because both dependence and determination can be considered functional relations.

A functional whole may be either balanced or unbalanced (stable or unstable), running counter to the notion that a Gestalt tends to become and to remain balanced. "Consequently it would be false to assume that only *balanced* functional wholes have a gestalt."

GRELLING and OPPENHEIM cautioned that the concepts of aggregative and functional wholes are not contradictory or exhaustive. For example, a whole may be such that one of its parts, but not all of its parts, depend on the remaining parts; thus it is neither a functional whole nor an aggregative or and-summative whole. Therefore, to say that something is not an aggregate does not suffice to characterize it as a functional whole: "this main concept of gestalt theory *has rather to be based*, as we have done, *on the notion of interdependence*."

Remembering GRELLING

GRELLING confided to OPPENHEIM and HEMPEL that he hoped that his work would not be entirely forgotten. To help to keep his memory and his contributions alive, his friends referred to GRELLING in the publications they authored or co-authored. An example came from a paper co-authored with Nicholas RESCHER which stated that "aspects of the concept of dependence have been studied by K. GRELLING and P. OPPENHEIM, with a special view to their bearing on the Gestalt concepts" (p. 97).⁵ An appended footnote, referring to the papers on the new logic, on dependence, and on functional wholes, credited GRELLING:

In these papers aspects of dependence, and of several related concepts, such as independence and interdependence, are studied. Much of the credit in connection with these clarifications is due to GRELLING, who fell a casualty to the Nazi terror. (Ibid)

Another example came from a paper co-authored by HEMPEL and OPPENHEIM:

Some of the ideas presented in Part II [*On The Idea of Emergence*] were suggested by our common friend, Kurt GRELLING, who, together with his wife, became a victim of Nazi terror during the war. These ideas were developed by GRELLING in a discussion, by correspondence with the present authors, of emergence and related concepts. By including at least some of that material, which is indicated in the text, in the present paper, we feel that we

⁵ Nicholas RESCHER and Paul OPPENHEIM, Logical Analysis of Gestalt Concepts, *British Journal for the Philosophy of Science*, 6, 1955, pp. 89-106. It builds on the concept of Gestalt in the GRELLING/OPPENHEIM papers; discusses the concepts of dependence and emergence; and offers a "topological" treatment of structural features of wholes.

are realizing the hope expressed by GRELLING that his contributions might not entirely fall into oblivion. (1953, p. 319n)⁶

GRELLING's modest hope was fulfilled, to judge by the current interest in his work and in his joint papers with OPPENHEIM, as well as in the analysis of the concept of Gestalt. Such interests are evidenced in references cited in the forthcoming biography, in this *Overview*, and in web sites that refer to their works. In particular, their reports are found in the book edited by Barry SMITH,⁷ which contains the functional whole paper and the new logic papers by GRELLING and OPPENHEIM as well as the paper on dependence by GRELLING. Another chapter of the book is a preamble to the GRELLING/OPPENHEIM Gestalt Papers.⁸ Also concerned with analysis of the Gestalt concepts of GRELLING and OPPENHEIM is a new book on musicology related to Gestalt theory and computing, edited by Marc LEMAN,⁹ especially a chapter on auditory perceptual organization.¹⁰

It seems clear that the contributions of GRELLING and of GRELLING and OPPENHEIM have not fallen into oblivion. But there is room for more attention to be paid to these important philosophers of science and to their ground-breaking work. It is hoped that the present reports will help to do so.

Summary

The *Overview* quotes from Paul OPPENHEIM's 1971 letter to A.S. LUCHINS and E.H. LUCHINS about the paper on Gestalt as functional whole that he had co-authored with GRELLING. Written in 1937/1938, the paper had been accepted for publication in the *Journal of Unified Science [Erkenntnis]* but it was not published due to war conditions. A similar fate befell GRELLING's paper on dependence. The *Overview* contains Ernest NAGEL's reviews of both papers in 1939 in the *Journal of Symbolic Logic*, based on preprints of them distributed but not read at the Fifth International Congress for the Unity of Science held that year at Harvard University. GRELLING had originally planned to attend the Congress but by June 1939 he had not received the necessary travel visa (perhaps because of difficulties in establishing his "Aryan" status as had been the case two years earlier) and, worried about the expenses and whether the trip was worthwhile, he abandoned his plans. The *Overview* also contains A.S. LUCHINS' and E.H. LUCHINS' review of the functional whole paper.

⁶ Carl HEMPEL and Paul OPPENHEIM, Studies in the Logic of Explanation, *Philosophy of Science*, 15, 1948, pp. 135-175. Reprinted as "The Logic of Explanation" in Herbert FEIGL and Mary BRODBECK (Eds.), *Readings in the Philosophy of Science*, Appleton-Century-Crofts, New York, 1953, pp. 319-352.

⁷ *Foundations of Gestalt Theory*, Barry SMITH (Ed.), Philosophia Resources Library, München-Wien, 1988.

⁸ Peter M. SIMONS, "Gestalt and Functional Dependence," in the volume referred to in Note 7, pp. 158-190.

⁹ *Music, Gestalt, and Computing: Studies in Cognitive and Systematic Musicology*, Marc LEMAN (Ed.), Springer-Verlag, Berlin-Heidelberg-New York, 1997.

¹⁰ Randolph EICHERT, Lüder SCHMIDT, and Uwe SEIFERT, "Logic, Gestalt Theory, and Neural Computation in Research on Auditory Perceptual Organization," in the volume referred to in Note 9, pp. 70-88.

GRELLING and OPPENHEIM had hoped that their papers would be published in a scientific journal. The publication in the present issue of *Gestalt Theory* of the functional whole paper, and the discussion of that paper and of GRELLING's dependence paper, help to fulfill their hope.

The *Overview* includes excerpts in which GRELLING's contributions were acknowledged in papers authored or co-authored by OPPENHEIM or by Carl G. HEMPEL, both of whom tried to rescue GRELLING from the Nazi-Vichy death trap, but their efforts were futile. The *Overview* concludes with remarks on the contemporary interest shown in analysis of Gestalt concepts that were undertaken by GRELLING and jointly by GRELLING and OPPENHEIM.

Zusammenfassung

Die *Übersicht* zitiert aus Paul OPPENHEIM's Brief an A.S. LUCHINS und E.H. LUCHINS zum Aufsatz über "Gestalt als 'funktionales Ganzes'", den er gemeinsam mit GRELLING verfaßt hatte. Die 1937/38 verfaßte Arbeit war zur Veröffentlichung in der Zeitschrift *Journal of Unified Science [Erkenntnis]* angenommen worden, wurde jedoch aufgrund der Kriegsbedingungen nicht veröffentlicht. Ein ähnliches Schicksal widerfuhr GRELLING's Aufsatz über Abhängigkeit. Die *Übersicht* enthält Ernest NAGELS 1939 im *Journal of Symbolic Logic* erschienenen Besprechungen der beiden Aufsätze. Diese Besprechungen bezogen sich auf die Vorabdrucke der beiden Artikel, die in diesem Jahr beim 5. Internationalen Kongreß für die Einheit der Wissenschaft an der Harvard University verteilt, aber nicht vorgetragen worden waren. GRELLING hatte ursprünglich geplant, an diesem Kongreß teilzunehmen; hatte diesen Plan jedoch aufgegeben, nachdem er im Juni 1939 die erforderlichen Reise-Visa noch immer nicht erhalten hatte (vielleicht, wie schon zwei Jahre vorher, weil es Probleme mit seinem "Ariernachweis" gab) und sich zudem Sorgen über die damit verbundenen Ausgaben machte und nicht sicher war, ob sich die Reise lohnen würde. Die *Übersicht* enthält weiters die Besprechung des Aufsatzes zum funktionalen Ganzen durch A.S. LUCHINS und E.H. LUCHINS.

GRELLING und OPPENHEIM hatten gehofft, daß ihre Aufsätze in einer wissenschaftlichen Zeitschrift erscheinen würden. Mit der Veröffentlichung des Aufsatzes über das funktionale Ganze und der Diskussion über diesen Aufsatz und GRELLING's Arbeit zur Abhängigkeit in dieser Ausgabe der *Gestalt Theory* wird diese Hoffnung zumindest teilweise erfüllt.

Die *Übersicht* enthält Auszüge aus verschiedenen von OPPENHEIM bzw. Carl G. HEMPEL verfaßten oder mit-verfaßten Aufsätzen, in denen die Beiträge GRELLING's gewürdigt wurden. OPPENHEIM und HEMPEL hatten versucht, GRELLING aus der Vichy-Falle der Nazis zu befreien, aber ihre Versuche waren vergebens. Die *Übersicht* schließt mit einigen Bemerkungen zum heute in verschiedenen Publikationen zutage tretenden aktuellen Interesse an der von GRELLING sowie von GRELLING und OPPENHEIM gemeinsam vorgenommenen Analyse von Gestaltkonzepten.

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