The Logic of Design Process
Invention and Discovery in Light of the Semiotics of Charles S. Peirce
What is the logic of design process? Departing from this question, Tiago da Costa e Silva investigates the characteristic feature of every projective activity, for instance, in architecture, design, engineering design, and in the arts. In opposition to predominant views that understand design processes as mechanical and deterministic, this study, with the help of the semiotics of Charles S. Peirce, characterizes design activities as continuous and serendipitous interplays of esthetic and abductive processes that define rules and manifest forms. Tiago da Costa e Silva concludes that invention and discovery, manifested in the form of processes of abduction, actively pervade every development in any given context of design process.

Tiago da Costa e Silva, born in 1978, researches design processes, semiotics, esthetics, and cultural techniques (Kulturtechniken) with special focus on form-giving processes, as well as on processes involving invention and discovery. A specialist in the field of the semiotics of Charles S. Peirce, he has been awarded the "Charles S. Peirce Young Scholar Award" for his publication on esthetic processes related to discovery. He is specialized in the fields of industrial design, visual communication, theory of communication, and semiotics as well as in theory and history of design. He is currently part of the research staff of the Cluster of Excellence Image Knowledge Gestaltung and of the Department of Cultural History and Theory (Institut für Kulturwissenschaft) at the Humboldt Universität zu Berlin, Germany.

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AN INTELLECTUAL JOURNEY

Poesie und Kunst also sind wie die zwei Einheiten: Poesie das, wodurch ein Ding Leben und Realität in sich selbst hat, Kunst das, wodurch es in dem Hervorbringenden ist.

The present study on the logic of design process in light of the semiotics of Charles S. Peirce is the result, or one of the results, of an adventurous journey that started many years ago, while I was still a bachelor student, wondering about the secrets of ingenuity, inventiveness, and the conditions of possibilities for discovery that take place in every form of artistic, intellectual, creative, and projective activities. As a student of industrial design, I was trying to understand the dynamic processes through which new ideas come into play, enter existence being graphed in a certain medium and gaining articulation in a certain language, becoming thus endowed with the potential to generate more fruitful inspirations in the form of signs, interpretations, and poetic effects, once the generated message is realized and exposed so it can be for others a matter of experience.

At that point, I was curious to understand the bases of poetic phenomena, the poeticity that can be encountered in many mediatic manifestations, such as in graphic novels, animations, films, posters, in works of theater, in photography and scenography, in games, in model making, in a detailed diorama, in computer models, and in so many more distinct forms of languages and media. Under these circumstances, I was not only seeking for theoretical instruments to decipher these poetic phenomena, but also – and, at that point much more important for me – to try to understand these phenomena and to replicate them whenever needed, pouring the discerned knowledge into a new project somehow pro-
grammed to produce poetic effects. Thus, as a student in this highly creative discipline, understanding the dynamics of certain events and poetic phenomena consisted in both comprehending these with certain theoretical knowledge that helped to access these dynamics as well as interiorizing these newly gained knowledge in order to articulate them in a given future project. At least, this was my immediate and pressing goal.

From the poeticity and from poetic experience, these interests have led me to further inquiry in more abstract and theoretical domains, were poeticity was philosophically studied, and this soon made room for curiosity about the philosophical considerations on the possibility of poeticity. From this moment onwards, I was intensely intrigued by the philosophical disciplines of esthetics and semiotics. But because these themes demand much time, devotion, and disciplined study, I started entering a highly theoretical field of inquiry and became more and more distanced from the practical realm of media and languages, of poeticity and practical poetical experience, until a long hiatus in such activities settled in.

But this I could not have imagined: during these long years in which I did not develop any substantial design, visual, or artistic project, the very motors that fueled my theoretical inquiries about esthetics and semiotics, of poetic and poeticity, of creativity and inventiveness were the very same impulses to project and develop design and artistic projects, such as graphics, animations, films, photography, model making, scenography, among many others that I intended to carry into execution and that alerted me to the occurrences of poetic experience in the very first place. Along with the important knowledge discoveries and productions that this research unveiled – and I really hope that this can be a valid contribution to various fields, especially to the field of theory of design as well as to the field of semiotics – the most important knowledge that I, the author, have gained, is this: these projects that I intended to carry out, that helped to define who I am as well as to define the course of my intellectual life for a long time, have kept my perception and my sensibility for poetic and esthetic processes lively, awake, for these projects, themselves, have been – and still are – begging me to make them concrete, to transform their mere potentiality into concrete poeticity, allowing them to enter the realm of existence, of concretion. To the extent that these potentialities become concrete, sprouting and spreading their esthetic and poetic fruits, these projects will be given not only a “local habitation and a name”, but real poetic life. And, in so doing – and this was part of this knowledge that still needs to be pursued – I would close this long cycle of learning about esthetics and poetics and experience poeticity for myself, no longer as an analyst, but as a creator – a creator that does not try to dominate the creation, but allows
the creation to be received in the mind, dialog with this mind, the creator becoming thus a vessel though which all these creative manifestations flow, appearing from the depths of the imagination, being poured into concrete esthetic experiences, experiments, manifestations, assuming many forms, spreading the freedom of such creations, molding them, transforming these manifestations into inventions, sharing their freedom, and giving them parts of my intellect by nourishing them into existence. With this realization came the recognition as well that the more I wanted to participate in the creative process, the more sensibility and humility I needed to cultivate in order to perceive the richness of poetic and esthetic phenomena that surrounds everything. And that – alone – is a life’s work.

The research project, upon which the present book is based, started officially in June 2013 when I became a PhD candidate under Prof. Susanne Hauser at the Department for History and Theory of Design, that is, the Institut für Geschichte und Theorie der Gestaltung, of the Faculty of Gestaltung of the Universität der Künste in Berlin while working at the graduate college Das Wissen der Künste at this university. The doctoral dissertation has been concluded on the 10th of April 2017, when I delivered it to the PhD committee of the Faculty of Gestaltung of the UdK-Berlin and has been defended on the 13th of February 2018. With the edition of the present book, this process reaches its culmination. In this particular investigation, I depart from a broader question related to the logic of design process. What is this logic? How does it become articulated within a particular process within a given projective activity? Based upon the framework of the semiotics of Charles S. Peirce, the book reveals the main characteristics of design process as a continuous and serendipitous activity hallmarked by the interplay of processes of esthetic experience, of defining rules, and of manifesting forms; and it concludes, furthermore, that invention and discovery are intrinsic to every development in any given design context.

The story of this research process is rather long and it would take many pages to write it down and depict all its efforts, its conflicts, its transformations, the growths of the main ideas guiding the thesis, as well as the researcher’s own personal difficulties, both cultural and linguistic, as well as his resolutions and decisions. Therefore, I offer the reader a description of the process in a rather different, and surely more esthetic manner: this particular research process is similar to Franz Liszt’s Hungarian Rhapsody no. 2, with all its conflicts, tensions, adventures, developments, inspirations, calmness, melancholic moments, thrilling moments, its decisiveness and strengths, its lightness and gentleness, and its fulfilling resolution at the end. These denominations, however, too vague a symbolic sign to denote what I here intend to express, need to be experienced as the mu-
sical qualities within the very unfolding of the musical piece. Only the experience of this musical piece in toto could offer, in the pure realms of experienced qualities, the similarities with the referred research process.

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The access to Charles S. Peirce’s unpublished manuscripts, which was made possible through the Peirce Edition Project at the Indiana University-Purdue University Indianapolis (IUPUI), enabled me to acquire a more accurate understanding of Peirce’s philosophical system and also, more specifically, of his research in general semiotics, pragmatism, the theory of discovery, qualia theory, and the theory of interpretants. Since the late seventies, the Peirce Edition Project has been organizing Peirce’s manuscripts in order to prepare these to be edited in chronological sequence and rendering Peirce’s entire philosophical system more comprehensible and available, thus allowing a more global understanding of what was before experienced only as bits and pieces of fragmented philosophical ideas. Tasked primarily with the edition of Peirce’s texts in a chronological sequence of volumes, the Writings of Charles S. Peirce: A Chronological Edition, the Peirce Edition Project is faced with challenges related to the interdisciplinary nature of Peirce’s works extending over different fields of knowledge, as well as with the problems of reconstructing Peirce’s thoughts extending over a vast amount of undated or unidentified manuscripts. In fact, the
reconstruction of some of Peirce’s texts, especially those concerning his later philosophy, involves a sort of detective work, in which the scholar must find, among a myriad of numbered papers, the right sequence to be able to reconstruct the totality of the manuscript. In most cases, the old numeric organization implies incomplete sequences of manuscripts. It is, therefore, necessary to examine virtually the entire corpus of Peirce’s production in order to identify the parts and variants of a given manuscript and to bring it into an editable sequence. Thanks to the Peirce Edition Project, which I visited for the first time in November 2014 and for a second time in April 2017, I was able to locate and study the four manuscripts upon which this research is based. The order of these four manuscripts had been already determined by a preliminary editorial process at the Peirce Project, which organized the raw manuscripts not only with respect to page numbering, but also included discarded versions or alternative constructions of the same document, so as to enable a reconstruction not only of the written ideas, but also of the developmental process of concepts and ideas Peirce underwent.

For this access and for the fruitful and important exchange of ideas, as well as for the confidence vested in the research work I was developing at the time of my visit, I express my deepest gratitude to Prof. André De Tienne, director of the Peirce Edition Project, to Martha Rujuwa, to Megan Liu Lizarme, and to Dr. Marianne Wokeck, director of the Institute for American Thought of the Indiana University-Purdue University Indianapolis (IUPUI).

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For conceding me the rights of the image in the book cover for the present edition, I am grateful to Tim Borgmann, the author of the image. I have chosen this image, named flow_strct02a (15/08) #7, for it expresses visually the kind of unfolding process and interweaving flowing streams that I imagine when considering design process as conceived from the scope of the semiotics of Charles S. Peirce. This particular image, I believe, enables the readership a more relational reading of the forms of processes that will be encountered in the book.

And, finally, I wish to express my deepest and sincere gratitude to Prof. Jürgen Schulz, the chairperson of my PhD committee and also, especially, to Prof. Susanne Hauser, to Prof. Judith Sigmund, and to Prof. Jörg Gleiter for their patience in letting this research grow, for having discussed, cherished and helped me to nurture and to cultivate the ideas expressed in this work, and for have be-
lieved that the ideas here presented can contribute to deeper theoretical discussions about design. While researching intensively the concepts of discovery, invention, design process, as well as semiotics, logic of relations, and pragmatism, I realized how important the community of researchers is in order to encourage and to promote further research questions, thus propelling science and research in a very open and honest manner. In this sense, for it has been, indeed, an intellectual journey – and with all due respect and admiration –, I wish to repeat these wise words: if I have seen further, it is by standing on the shoulders of giants.

This book is dedicated to those who accompanied me throughout this intellectual journey, and, in particular to my beloved wife, Alexandra, and to my dear family. And also to all those who have spiritually enlightened this research process, for they all believe that education and research are powerful means to contribute with the growth of concrete reasonableness in the world. Here is a small token of what I have learned and now wish to share with you:

**THESEUS**

The poet’s eye, in fine frenzy rolling,
Doth glance from heaven to Earth, from Earth to heaven;
And, as imagination bodies forth
The forms of things unknown, the poet’s pen
Turns them to shapes, and gives to airy nothing
A local habitation and a name.
Such tricks hath strong imagination
That, if it would but apprehend some joy,
It comprehends some bringer of that joy;
Or in the night, imagining some fear,
How easy is a bush supposed a bear!

**HIPPOLYTA**

But all the story of the night told over,
And all their minds transfigur’d so together,
More witnesseth than fancy’s images
And grows to something of great constancy;
But, howsoever, strange and admirable.

*William Shakespeare, A Midsummer Night’s Dream*, Act 5, Scene 1

Tiago da Costa e Silva
Berlin, 24th of August 2018
Introduction

What is the logic at work in design process? Departing from this question, the present book proposes an inquiry into the logic of design process, that is, the logic present in every manifestation of projective activities, such as those that are more prominent in – but not exclusive to – the fields of architecture, design, engineering design, and also the arts. Hence, the object of study of the present inquiry is the logic of the purposeful, projective action of design process and its consequent performance in carrying out a projected content in the field of disciplines that are generally related to the creative, the inventive, which, in their turn throughout this process, bring about novelty, both technically and culturally.

The main objective of this work is to inquire into the logic of design process while focusing on invention, discovery, and form-giving processes in light of the semiotics of Charles S. Peirce. This specific study of semiotics has been chosen because of its capability to examine dynamic processes by which articulation novelty arises, becomes embodied, and can be integrated into wider systemic contexts. Stated otherwise, Peirce’s semiotics is able to cope with the processuality of projective activities, which are a characteristic feature of design process in a general sense. The leading thesis of the book is that the logic of design process is characterized by a logic of events exhibiting symbiotic operations of invention, discovery, form-giving, and rule-finding processes. As the book will show in detail, this logic of events, in its phaneronic, or phenomenal, semiotic, and pragmatic dimensions, is the most predominant characteristic feature of design process.

The concept of design process is here understood as equivalent to the German concept of Entwerfen, which, in general terms, describes the all-encompassing projective activity that includes the formulation of new mental concepts out of newly structured ideas, the production of further conceptualizations, and the subsequent unfolding of possibilities for the realizations of these
concepts in mediative supports, articulated with a possible or with an already established given language.

In answering the stated research question, that is, “what is the logic at work in design process?” and inquiring into the processuality of design process in light of semiotics, this book aims at overcoming two major problematic views present in the vast majority of the contemporary design theories. The first is the problematic tradition of psychologically-based rigid stage models injudiciously articulated to substantiate cognitive processes in design process. The vast majority of the theoretical accounts make use of rigid stage cognitive models either based mainly upon behaviorist operations research or upon information processing theory and describe design process as consisting in discrete, deterministic, and highly mechanic stages of operations. In this rather stratified view of the process, the occurrence of synthesis is neither fully explained nor comprehended. The second problematic view is the theoretical confusion that involves diverse sign theories and sign systems in relation to the study of projective activities in general and design process specifically. Diverse sign theories, sign systems, and varieties of semiologies and semiotics, including fragments of Peirce’s own semiotics, have been used to provide the foundation of studies in the fields where design process is operative. However, the inadvertent admixtures of different sign theories originated a great conceptual confusion, resulting in a significant scepticism toward the validity of these sign theories in general, and of the semiotics of Peirce specifically, as worthy theoretical frameworks of research.

The research methods articulated in the present inquiry are of two kinds. The first one is the hypothetico-deductive method, and the second is the inductive method. The first describes the proposal of a new thesis to explain a certain state of things. The consequences of the stated hypothesis are then drawn. This method is appropriate for a theoretical and theorematical inquiry, such as the one here proposed. The second is related to the reconstruction of the theoretical framework of Peirce’s semiotics. The bases of this reconstruction are the four manuscripts selected as grounds for this theoretical framework in what relates to dis-

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1 As indicated in the bibliographical references, whenever a manuscript from Peirce’s work is mentioned, the numbers following are referring to the Charles S. Peirce Papers Microfilm Edition (Harvard University Library, Photographic Service, 1966). References employ the numbering system for manuscripts (MS#) developed by R. S. Robin in his Annotated Catalogue of the Papers of Charles S. Peirce (Amherst: University of Massachusetts Press, 1967), as supplemented by Robin in “The Peirce Papers: A Supplementary Catalogue,” Transactions of the Charles S. Peirce Society, vol.
covery and invention, to the logic of events, to the pragmatic process, and to the logic of abduction. Therefore, these four chosen manuscripts are relevant to the present inquiry upon design process, for they furnish the main theoretical background with which the logic of design process can be tackled.

The first selected manuscript, numbered MS 693, entitled “Reason’s Conscience: A Practical Treatise on the Theory of Discovery wherein Logic is conceived as Semeiotic” was written in 1904. It contains an important formulation of semiotics as logic, in which Peirce emphasizes his later theory of inquiry and theory of discovery, especially from a systemic standpoint, which mobilizes mathematics, phaneroscopy, and semiotics. Here, Peirce also emphasizes the active role of imagination and thought while performing a task that will eventually lead to the process of discovery.

The second manuscript is composed of three segments denominated, respectively, MS 940, 941, and 942. This composite manuscript was written in 1898 as a preparation for the eight conferences Peirce delivered that same year in Cambridge. The first segment bears the title “Logic of Events”. The second segment is entitled “Notes for Eight Lectures”. The third, and largest, is entitled “Abstracts of 8 Lectures”. The first two segments of the manuscript develop the concept of logic of events based on Peirce’s hypothesis of formation and qualia and also on the continuity of qualias. The third, the longest and most complex segment of the manuscript, MS 942, elaborates further on the hypothesis of the formation of qualia-dimensions, which subsequently further defines sets of events within a formative process. Peirce’s theorem of the formation process has a mathematical, or rather a topological form, and is very abstract in its content. It is, however, an idea, a general concept, not restricted to mathematics. Mathematics helps to comprehend the ideas of formation, or, as he defines it, the logic of events, described in the manuscript in a theorematic manner. The importance of the present manuscript is specifically the model of formation inherent to the logic of events, the models of growth, affectability of ideas and evolution of mind.

The third manuscript, MS 283 entitled “The Basis of Pragmaticism”, presents the main elements that characterize his maxim of pragmatism – here re-denominated pragmaticism, in order to differentiate it from other more popular
and disseminated variants of pragmatism. As Peirce contends in this manuscript, the bases of the maxim of pragmaticism are located in the normative sciences, that is, in the most theoretical of the positive philosophical disciplines. The articulation of these sciences is what renders pragmaticism operational and useful as a general scientific method. Peirce focuses upon semiotics as the key science from which a proof of pragmaticism can be demonstrated. This highly intricate manuscript also reveals more specific details about the composition of a sign as well as of the sign process, or *semiosis*. For example, the concept of *quasi-mind* inherent to the sign, which represents a potential of the sign to be interpreted as another sign and so propelling semiosis. Peirce proposes that the act of interpretation within a semiosis is a form of translation. Therefore, according to him, semiosis is the process of a sign being interpreted – or translated – into other more developed signs, as well as into habits of action.

The fourth selected manuscript, the highly complex and multi-layered MS 318, entitled simply “Pragmatism”, was written in 1907. The extant manuscript is composed of several formulations on the proof of pragmatism. This manuscript puts forward important developments in the field of semiotics, especially with reference to the concept of the interpretant. Peirce completed his theory of *interpretants* in this manuscript. Searching for the proof of his pragmatism, Peirce saw the need to further develop his concepts of logic and semiotics. The object of study in this manuscript is the cognitive operation. According to the formulation in the manuscript, intellectual concepts are the only types of signs that can produce a newly identified type of interpretant, that is, the logical interpretant. The logical interpretant consists not merely in an actual interpretation, but in the self-controlled production of a new habit, that is, in Peirce’s terms, the predisposition to act in a certain way according to the interpretant generated. Peirce reveals in this manuscript that only the meanings of intellectual concepts are pragmatically ascertainable, because they are the only types of signs that carry implications concerning general behavior. This newly introduced improvement upon his previous notion of semiosis sheds new light on the concept of

...er destiny; while to serve the precise purpose of expressing the original definition, he begs to announce the birth of the word ‘pragmaticism’, which is ugly enough to be safe of kidnappers.” (PEIRCE, 1905b: 166). Despite this change, Peirce will still use the concept *pragmatism* in the following years as to mean his version of it; the denomination *pragmaticism*, although important to accentuate the important distinction between Peirce’s original and scientific maxim of logic from the myriad of variants – especially from the utilitarian and from the psychology-based variants – that appeared afterwards, will be short-lived.
pragmatism, connecting it with the theory of interpretants. With the introduction of the concept of the logical interpretant, that is, an interpretant that carries within it a formulation, such as in a plan to conceive and form new habits of conduct, pragmatism can be understood as a principle of inquiry that requires the medium of purposeful action. For it is only through this medium of purposeful action that intellectual concepts in general can overcome their self-reference, reaching new objects and relationships. It does also happen even if only a potential action for a possible purpose is devised, for it has also the power to change conduct.

Based upon the knowledge produced in these four manuscripts, the present book shows that design process – in light of Peircean semiotics – is revealed as a generative, continuous process promoting the unfolding of further form-giving processes executed under a given set of circumstances, thus allowing innumerable manners with which relations can be accessed, grasped, and captured. Design process becomes understood as a flowing stream of semiotic processes, which integrates processes of inventing, discovering, form giving, rule finding, and experimenting. It is capable of continually replenishing the projective context with originality and freshness again and again; because these formed projected relations gain their own reality and existence, they feed back to the mind as an esthetic and pragmatic dialog.

Furthermore, this inquiry reveals that, while engaging in design process, the projecting mind forms purposeful conceptual projections, which lead to a mindset to imagine, to combine, to discover, as well as to guide actions connected to the mindset in order to carry a particular plan into execution. And, in so doing, there will always be an experimental aspect connected to this conceptual projection. The logic of events observable in every act of invention and discovery, hereby circumscribed by the Peircean framework of semiotics, amounts to the most predominant characteristic feature of design process in its phaneronic or phenomenal, semiotic, and pragmatic dimensions. In this realm, the technical and the practical are not separate from the mental. They are all forms of mental processes and are, therefore, still connected. This inquiry unveils as well the dynamics connecting the appearance of a new idea to the perceiving mind as a result of an abductive process with the flowing stream of semiosis in the form of conceptions and further embodiments. It unveils, furthermore, the esthetic atti-

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I am using the term flowing stream based upon André de Tienne’s article “The Flowing Stream that carries Pragmatism: James, Peirce, Royce” (De Tienne, 2007: 45-68). This concept along with its implied relation to design process will become clearer in the development of the first part of the book. A comprehensive treatment of the concept of semiotic flowing stream is developed in the fourth part of the book.
tude of mind and the close relation between abduction and esthetic principles, for this relation influences the occurrences of further syntheses within design process. It also reveals the pragmatic aspect inherent to design process, especially because, in the course of the process, newly discovered relations and elements will be brought into a more global context of design system.

As a generative process, design process reveals itself as a pragmatic action that proposes the differentiation of the newly discovered elements and relations and their modes of operation into different levels of semiotic interpretations, opening thus possibilities for further discoveries and realizations. The modalization and interpretational processes unveil the potentiality to engage with new differentiated discoveries.

Furthermore, these subsequent discoveries offer the heuristic possibility to integrate these newly found elements and relations into the major design context again and again, thus further propelling a given project. Peirce’s maxim of pragmatism is embedded with the logic of abduction. Now, the logic of abduction implies the synthesis of state of things or relations never conceived before, but concomitantly requires further inferential modes in order to set a given plan of experimentation.

I use the terms idea, concept, and conceptualization to imply here distinct kinds of operations within the logic of design process. Idea means here a process describing the generation of a new idea that appears to the perceiving mind through an abductive process. Concept means here the initial mediatization or representation of the idea in a more defined manner – for instance, something captured in a sketch on a paper or on canvas to serve as a registration of the first imprints and relations emerging in the mind. Conceptualization here refers to the further development aiming at a determined realization of certain purposes drawn from the idea and from concepts, and yet being constantly contrasted with the initial idea.

In this context, concepts and conceptualizations are characterized by percolations of processes of form-giving and rule-finding triggered by – and reciprocally enabling the growth of – a given idea. Invention, in light of semiotics, takes the shape of a process of hypostatization, in which something newly discovered insinuates itself persistently to the perceiving mind, although still ephemeral. As a result, it must be formulated in the perceiving mind in a more intelligible manner. It is important to reiterate that abductive processes will continuously appear within the formulations and executions of concepts and conceptualizations, for inventions and discoveries pervade every form of development in the process.

Aiming at a valid contribution to the field of theory of design, the book reintroduces, according to the selected manuscripts, a newly restructured and opera-
tive conception of Peircean semiotics into the mainstream of the theoretical investigation as a valid framework in order to study and to comprehend intricate, delicate, and subtle relations in generative, interpretative, and highly processual dynamics, such as the relations and the logic of events at work in design process. The present book enables, therefore, a more solid understanding of the logic of design process – in the broad sense of the term, thus contributing to the theoretical studies of processuality in design. This work also contributes to other fields, such as semiotics, esthetics, phenomenology, psychology, engineering, and arts since it proposes a context, in which these themes can be studied reciprocally within the definite processual field of design process.

In order to proceed with the proposed research and address the thematized problems, let me introduce a structure for the present work. This book is divided into three major parts.

Part one, entitled “Flowing Stream of Unfolding Projections. On the Intrinsic Processuality and Projectuality of Design Process” introduces design process as an object of inquiry of the present work. Design process is here defined as a projective activity with pragmatic character; that is to say, it renders perceivable effects from ideas and engages with a form-giving process. The pragmatic character that underpins design process lies in its processuality as an operation that connects conjectures with a driving impulse to exteriorize and connects also the mental, intellectual, and intentional with the material, with the perceivable, and with a self-controlled action. Furthermore, design process, as an analogue to the German term *Entwerfen*, bears a broader meaning and is endowed with a type of processuality that cannot be decomposed into stages, since it its operation is characterized as a flowing stream of processes of invention and discovery that simultaneously unfolds along the effectuation of a given projective activity. Here, I also discuss the characteristic logic of events that unfolds within design process. Originating from the projection of given states of things, this logic comprises the effort of projecting these into existence by the elaboration of a form of plan and then, systematically, while confronting each of these newly achieved embodiments and contrasting these with the mentally proposed state of things, elaborating manners with which these projected states of thing could be carried out into execution until a given fulfillment or purpose is sufficiently achieved. In this part, I also revisit the methods of the present research and discuss in a more detailed manner the proposed reconstruction of the framework of semiotics from the selected manuscripts. Anticipating the content of the third part of the book, I discuss in more detail, with the aid of examples, the contributions gained from this reconstruction. This first part also introduces the major problems relative to the two problematic traditions, that is, the tradition of psy-
ehology-based paradigms attached to the current discourses of design process, and the tradition of using sign theories and sign systems as theoretical bases for inquiring into design process. This part introduces the discussion of the current state of affairs related to the concepts of invention and discovery within design process, concluding with the need for critical analysis of the so-called rigid-stages, upon which the current notion of design process is based.

Part two, entitled “A Critical Analysis of a Problematic Tradition. The Paradigmatic Rigidity Encapsulated in the Current Discourses of Design Process”, addresses the problem of the theoretical bases that underpin the predominant current notions of design process extracted from – or mostly influenced by – models drawn from psychology. Because the discussions about problem solving, creativity, invention, and discovery are predominantly based on psychological theories and methods, this part focuses, therefore, on the paradigmatic antecedents of such theories by providing an overview of early psychological positions such as associationism, early twentieth century experimental psychologies based on introspective methods, schematism related to the Gestalt psychology, behaviorism, and also information processing theory. This critical analysis also provides an overview of the influences originating from these early psychological positions, which have been imputed into design process with special emphasis upon the critical reading of the common – but injudicious – usages of concepts such as that of psychological creative problem solving. Considered from the perspective of such psychological purviews, these concepts become understood as rather stratified progressions of sequences in the form of rigid stages. This part of the book analyses the general tendency to reduce the whole of design process to a rigid stage version of problem solving. The present inquiry concludes with a critical analysis of the limitations of this specific psychological scope as a solid foundation for design process for the reason that these psychological paradigms are still based upon rigidly stratified models of “operational” creativity. This analysis opens the pathway to discuss design process, invention, and discovery from a philosophical and semiotical perspective.

Part three, entitled “A Detailed Account of Semiotics. From the Pastiche of Sign Theories to a Clarified Processuality of Design Process in Light of the Semiotics of Charles S. Peirce” first addresses the problem of the complicated tradition between sign theories, sign systems, diverse semiotics and design process. In order to understand the problematic traditional relationships between diverse sign theories and design process, the present part presents an overview of the most significative sign theories that have had some bearing upon and are still present in the discourses connected with design process. As an attempt to shed light upon the myriad of sign theories correlated with design process, the chapter
presents a brief overview of the underpinning paradigms of the most significant sign theories, sign systems, semiologies and semiotics. Moreover, this part thematizes the pastiche of sign theories within design process and sets out to dismiss some equivocal points that impel the current skepticism toward the efficiency of semiotics in general, casting doubts upon its value as an instrument of analysis. After that, this part presents in detail Peirce’s semiotics within his system of thought. Here, I discuss how Peirce devised his own architectonic system of philosophy. Based upon the precept of principle and data dependency, the present analysis concludes that semiotics will always rely on the results of the phenomenological analysis of experience. Following this development, I present semiotics among the normative sciences of esthetics and ethics, and discuss their function within the system by showing how semiotics draws its principles from the more abstract and theoretical sciences, such as phaneroscopy and mathematics, and studies its objects in three branches. The first branch, speculative grammar, studies its objects in light of the types of signs produced within a given semiotic process. The second branch, logical critic, studies its objects in light of logical inferences proposed by a given semiotical operation. The third branch, methodeutic, studies its objects in a broader way, proposing general procedures of inquiry and suggesting courses of action for guided experimentations according to the nature of its objects of study. It is in this third branch of semiotics that the maxim of pragmatism becomes operative as a principle of logic. Based upon the logic of abduction, the maxim of pragmatism proposes the formulation of plans for certain courses of action. The logic of abduction is exactly the logic of the formulation of a synthesis that shall enable the formation and development of concepts. Logic of abduction calls for experiments and conceptualizations, which further enables the discovery and differentiation of new ideas, as well as the systematic integration of such new ideas into the form-giving process.

This general open-ended inquiry proposed by methodeutics as well as the logic of abduction at the core of the maxim of pragmatism, are the most important aspects relative to the study of the logic of design process. The characteristic feature of abduction as an inference that underpins invention and discovery is of prime relevance for design process.

Furthermore, this part of the book explores design process in light of the concepts of semiotics developed from the previous parts and from the selected manuscripts. In order to grasp design process as semiosis, this part revises and reassesses the thesis on design process considering it in its phaneronic, or phenomenical, semiotical, and pragmatic dimensions. With the aid of Peirce’s concept of abduction – here understood both as a logical inference and as a living principle of the mind – I propose a semiotical account of invention, discovery, and
formation. Here, it is shown that these are inherent processes within every form of design process. Emphasizing the principles that propel the specific type of synthesis, abduction is here discussed at length and considered thereby as an inferential and esthetic principle by which every process of invention and every form of discovery comes into play. In order to define design process as semiosis, I reassess the logic of events intrinsic to this process and discuss the logic of events of perceiving a new idea, of formulating conceptions and conceptualizations based on the perceived new idea, and of embodying these concepts in different mediative supports with different techniques and languages. For that reason, this part retrieves Peirce’s phaneroscopy and theory of perception, for it is important to discuss, at this point, the transitional point between phaneron as appearance and sign as representation. Moreover, this section stresses as well the dynamics connecting the appearance of a new idea to the perceiving mind as a result of an abductive process with the flowing stream of semiosis in the form of conceptions and further embodiments. It describes, furthermore, the esthetic attitude of mind and the all-important close relation between abductive procedures and esthetic principles, for this relation influences the occurrences of further syntheses within design process. The chapter also thematizes the pragmatic aspect inherent to design process, especially because, in the course of the process, newly discovered elements will be brought into a more global context of design system. It presents, as well, a sketch of the iconoscopy pervading design process. There is a certain regulative conduct that tends to adjust the relation between the generated idea, the conceptualizations, and the subsequent formative processes. In close connection to iconoscopy within design process, the chapter presents a thorough description of the process of form-giving, or formativity, as a process of growth that accompanies the development of every design process.