# THE PROBLEM OF EPISTEMOLOGICAL OBSTACLE IN SCIENTIFIC ACTIVITY: CANONIZATION IN TEXTBOOKS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

YANKI DORUK DOĞANAY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF SOCIOLOGY.

JULY 2023

Approval of the thesis:

**THE PROBLEM OF EPISTEMOLOGICAL OBSTACLE IN SCIENTIFIC ACTIVITY: CANONIZATION IN TEXTBOOKS**

submitted by **YANKI DORUK DOĞANAY** in partial fulfillment of the requirements for the degree of **Master of Science in Sociology, the Graduate School of Social Sciences of Middle East Technical University** by,

Prof. Dr. Sadettin KİRAZCI
Dean
Graduate School of Social Sciences _____

Prof. Dr. Ayşe Nur SAKTANBER
Head of Department
Department of Sociology _____

Assist. Prof. Dr. Barış MÜCEN
Supervisor
Department of Sociology _____

**Examining Committee Members:**

Assoc. Prof. Dr. M. Nedim KARAKAYALI (Head of the Examining Committee)
Bilkent University
Department of Political Science and Public Administration _____

Assist. Prof. Dr. Barış MÜCEN (Supervisor)
Middle East Technical University
Department of Sociology _____

Assoc. Prof. Dr. Erdoğan YILDIRIM
Middle East Technical University
Department of Sociology _____

**I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.**

**Name, Last Name:** Yankı Doruk DOĞANAY

**Signature:**

## ABSTRACT

THE PROBLEM OF EPISTEMOLOGICAL OBSTACLE IN SCIENTIFIC ACTIVITY: CANONIZATION IN TEXTBOOKS

DOĞANAY, Yankı Doruk
M.S., The Department of Sociology
Supervisor: Assist. Prof. Dr. Barış Mücen

July 2023, 83 pages

The common-sensical view and philosophers of science attribute the characteristic of progress to scientific transformation by abstracting scientific activity from its social embeddedness. Conversely, this dissertation aims to investigate the social embeddedness of scientific transformation around the question of whether there exists a narration of scientific transformation or not in scientific textbooks and if it exists how it is narrated. I investigate this issue by analyzing two textbooks including *Concepts of Modern Physics* textbook by Arthur Beiser and *Introducing Cultural Studies* textbook by Longhurst et al. The reason behind selecting textbooks as the objects of study is that these textbooks provide insights into the canonization of scientific activity in the social context in contrast to scientific activity in its abstract form. I analyze these textbooks by employing the analytical frameworks of Bachelard and Althusser around the notion of 'epistemological obstacle'. Within this framework, I discuss the textbooks' narration of scientific transformation between contemporary and previous scientific activities. Firstly, I discuss Longhurst et al.'s narration that contemporary cultural studies breaks from essentialist and reductionist

approaches by taking cultural complexity into account. Secondly, I analyze Beiser's narration that modern physics breaks from the notions of absoluteness and universality rooted in classical physics. I argue that there exists a continuity in the organizing principles on which analytical concepts are rooted in the previous and current scientific activities as narrated by textbooks. Nevertheless, I also argue that these concepts multiply and become more particularistic in their narration.

**Keywords**: scientific transformation, epistemological obstacle, cultural studies, modern physics, scientific textbooks

# ÖZ

BİLİMSEL AKTİVİTEDE EPİSTEMOLOJİK ENGEL PROBLEMİ: DERS KİTAPLARINDA KANONLAŞMA

DOĞANAY, Yankı Doruk
Yüksek Lisans, Sosyoloji Bölümü
Danışman: Assist. Prof. Dr. Barış Mücen

Temmuz 2023, 83 sayfa

Genel sağduyu ve bilim felsefecileri, bilimsel etkinliği toplumsal yerleşikliğinden soyutlayarak, bilimsel dönüşümü ilerlemeci olarak ele alırlar. Öte yandan bu tez, bilimsel dönüşüm anlatısının bilimsel ders kitaplarında var olup olmadığı ve varsa nasıl anlatıldığı sorusu etrafında bilimsel dönüşümün toplumsal gömülülüğünü araştırmayı amaçlamaktadır. Bu konuyu Arthur Beiser'in *Concepts of Modern Physics* ders kitabı ve Longhurst ve arkadaşlarını tarafından yazılan *Introducing Cultural Studies* ders kitabı dahil olmak üzere iki ders kitabını inceleyerek araştırıyorum. Çalışma nesnesi olarak ders kitaplarının seçilmesinin nedeni, bu ders kitaplarının, bilimsel etkinliğin soyut biçiminin aksine, sosyal bağlamda bilimsel etkinliğin kanonlaştırılmasına ilişkin veri sağlamasıdır. Bu ders kitaplarını Bachelard ve Althusser'in analitik çerçevelerini 'epistemolojik engel' kavramı etrafında kullanarak analiz ediyorum. Bu çerçevede, bu tez ders kitaplarının günümüz ve önceki bilimsel etkinlikler arasındaki bilimsel dönüşüm anlatımını ele almaktadır. İlk olarak, Longhurst ve arkadaşlarının, çağdaş kültürel çalışmaların kültürel karmaşıklığı öne çıkararak özcü ve indirgemeci yaklaşımlardan koptuğuna dair anlatımını tartışıyorum. İkinci olarak, Beiser'in, modern fiziğin klasik fizikte

köklerini bulan mutlaklık ve evrensellik kavramlarından koptuğunu vurgulayan anlatımını inceliyorum. Bu tez iki temel iddiaya sahiptir. İlk olarak analitik kavramların, ders kitaplarında anlatıldığı şekliyle önceki ve şimdiki bilimsel faaliyetlere dayandırıldığı düzenleme ilkelerinde bir süreklilik bulunmaktadır. Bununla birlikte, bu analitik kavramlar çoğalmakta ve tikelleşmektedir.

**Keywords**: bilimsel dönüşüm, epistemolojik engel, kültürel çalışmalar, modern fizik, bilimsel ders kitapları

**TABLE OF CONTENTS**

PLAGIARISM ..... iii
ABSTRACT ..... iv
ÖZ ..... vi
TABLE OF CONTENTS ..... viii
ACKNOWLEDGEMENTS ..... xi
CHAPTERS
1. INTRODUCTION ..... 1
1.1. Sociology and History of Scientific Knowledge: Methodological Considerations I ..... 3
1.1.1. Social Character of Knowledge ..... 3
1.1.2. Modernity and Postmodernity ..... 4
1.1.3. Bringing Marx Back in & The Question of Ideology ..... 6
1.2. The Problem of Epistemological Obstacle and Common Sense: Methodological Considerations II ..... 7
1.3. Neoliberalism and the Privatization of Knowledge: Literature ..... 11
1.4. Tools of Analysis ..... 13
2. STRUCTURAL VARIABLES OF AGE, GENDER, RACE, AND CLASS: THE PROBLEM OF EPISTEMOLOGICAL OBSTACLES IN HUMANITIES ..... 16
2.1. Chapter Introduction ..... 16
2.1.1. Essentialism and Reductionism ..... 17
2.1.2. Bachelard, Althusser, and Epistemological Obstacles in Cultural Studies ..... 18
2.1.3. Epistemological Obstacles, Multiplication, and Particularity ..... 19
2.2. Culture as an Unexplained Complexity ..... 20
2.2.1. Traditional Marxism and Reductionism ..... 21
2.2.2. Weber as a Pioneer of Attempt to Break Epistemological Obstacles ..... 23
2.2.3. Castes as an Example of Status Groups ..... 23

2.2.4. Reproduction of Epistemological Obstacles in the Case of Complexity .. 25
2.3. Locality for Overcoming Overgeneralization ..... 26
2.3.1. Foucauldian Notion of Power and Locality ..... 27
2.3.2. The Possibility of Challenge of Structural Variables ..... 29
2.3.3. Reproduction of Epistemological Obstacles in the Case of Locality, Particularistic, and Multiplied Concepts ..... 30
2.4. Particular Perspective and Transhistorical Perspective ..... 32
2.4.1. Western Middle-Class View of Children and Other Parts of the World .. 33
2.4.2. Hybridity and Intersection of Cultures ..... 34
2.4.3. Reproduction of Epistemological Obstacles in the Case of Perspective, Particularistic, and Multiplied Concepts ..... 35
2.5. Chapter Conclusion ..... 36
3.UNIVERSAL AND ABSOLUTE: THE PROBLEM OF EPISTEMOLOGICAL OBSTACLES IN PHYSICS ..... 39
3.1. Chapter Introduction ..... 39
3.1.1. Absoluteness and Universality: Frame of Reference, Uncertainty, and Indeterminacy ..... 40
3.1.2. Absoluteness and Universality as Epistemological Obstacles and Common Sense Knowledge ..... 41
3.2. Different Frames of References, Relativity, and the Speed of Light ..... 43
3.2.1. Frames of References contra Universality and Absoluteness of Time ..... 44
3.2.2. Speed of Light as a Universal and Absolute Constant ..... 45
3.3. Wave-Particle Duality and Planck Constant ..... 48
3.3.1. The Collapse of the Absolute Duality between Waves and Particles: The Notion of Quanta ..... 48
3.3.2. Planck Constant as a New Absolute ..... 50
3.3.3. Reproduction of Epistemological Obstacles in the Case of Planck Constant, Particularistic, and Multiplied Concepts ..... 53
3.4. Uncertainty Principle and Schrödinger Equation ..... 54
3.4.1. Uncertainty Principle: The Effect of Observation ..... 55
3.4.2. Inherent Indeterminacy of Physical Bodies ..... 56
3.4.3. Reproduction of Epistemological Obstacles in the Case of Schrödinger Equation, Particularistic, and Multiplied Concepts ..... 58

3.5. Chapter Conclusion ..... 60
CONCLUSION ..... 63
4.1. General Summary of Analysis ..... 63
4.2. Scientific Activity and Neoliberalism ..... 66
REFERENCES ..... 68
APPENDICES
A. TURKISH SUMMARY / TÜRKÇE ÖZET ..... 73
B. THESIS PERMISSION FORM / TEZ İZİN FORMU ..... 83

## ACKNOWLEDGEMENTS

First, I would like to thank my advisor, Dr. Barış Mücen, who read hundreds of pages that never resembled a thesis written by me, gave me an accelerated introductory sociology course in this process and helped me complete my thesis with his endless effort. In addition to joining my jury, I would also like to thank Dr. Erdoğan Yıldırım because of his courses and our dialogues which led me to hours of theoretical excitement and contemplation. Finally, I would like to thank Dr. Mehmet Nedim Karakayalı.

With his comments and criticisms, he helped me to further organize my thesis alongside his participation in my jury.

Since I came to the department, academic activities have not only been a relationship between the text and me but also included all the interactions that took place in the campus environment. During the process of writing my thesis, many friends of mine were with me, which I may not be able to list all of them here. I am thankful to all due to both our personal and academic discussions. I would like to thank my colleagues in room B232, Nisan Aktürk and Dilara Cılızoğlu, who put up with my loud and boisterous attitude even while writing the thesis, as well as Umut Gülcan, Duygu Tanık and Ekin Aktarıcı who were with me every step of the way from our conversations in the canteen to our interactions in daily life. I would like to thank Mert Arık, who, almost like an advisor, helped me avoid many material mistakes with his criticisms and comments in the parts I wrote on physics. I would like to thank Deniz Çelik, Özge Özkan and Göktuğ Solak who have been with me for years, who made me feel that I was never alone, and who always made me think that there was someone there for me, whether it was my academic or personal problems.

I see my academic activity and the completion of this thesis as a process in which many people participate, beyond a personal achievement. Dilan Yıldırım not only

read my thesis page by page and presented her critiques, but also listened to me to the end whenever I failed and at every point I complained about. This thesis would have been impossible without her emotional support beyond her academic contribution. I would like to thank Dilan Yıldırım for all her efforts, for her criticisms she put forth with a meticulousness that sometimes gets on my nerves, and beyond that, for always being there for me.

Throughout my academic life, I have stood in front of people with sometimes absurd and sometimes annoying theoretical discussions. In the whole process, Yağmur Hasdemir listened to me, criticized me, and gave all of her attention. Without her comments and criticisms, I could not have progressed either intellectually or emotionally. Aside from her contribution to my current accomplishments I would like to thank Yağmur Hasdemir, who I know has always been there for me and will always be.

Although I have always believed in the value of broadening my horizons and intellectual evolution, I approach everything in a stubborn and sectarian way. Elif Cansu Gümüşpala had the biggest role in widening my horizons and contributed to my personal growth. Without their unconditional care and our endless dialogues, I could not only complete this thesis but it would also be impossible for me to find courage to apply Ph.D. programs abroad. I always feel so joyful with our dialogues lasting hours and hours and I would not have felt so happy and safe today without their great support and love.

Last but not least, I am really thankful for my parents Sibel Tutal and Hasan Doğanay. When I was a little child, I used to be afraid of being a child of different parents than theirs in my speculations of a possible alternative world. My fears have not changed at all. They were the real architects of all of my accomplishments in my life. Although it sounds cliche to say so, they were not only parents for me but friends and companions.

# CHAPTER 1

## INTRODUCTION

"the ideas of modern physics represented totally new directions in thought when first proposed, rather than extensions of previous knowledge" (Beiser, 2003, p. xii)

"Cultural studies is a new way of engaging in the study of culture. In the past many academic subjects - including anthropology, history, literary studies, human geography and sociology - have brought their own disciplinary concerns to the study of culture." (Longhurst et al., 2008, p. 1)

These two quotations are taken from two influential textbooks. One is from *Concepts of Modern Physics* textbook by Arthur Beiser, while the other is from *Introducing Cultural Studies* textbook by Longhurst et al. Although the subject matter of these textbooks is completely different, these two quotations have something in common. Both of these quotations narrate a transformation within the scientific activity. They both see modern scientific conceptualization as a break from previous knowledge. This dissertation aims to investigate and problematize the notion of scientific transformation.

Common-sensical view approach to scientific transformation by regarding it as a matter of progress inherent in the scientific activity. Several philosophers and scholars likewise abstract the scientific transformation from its social embeddedness by emphasizing the same notion of progress. Niiniluoto suggests that (2019, para. 24) while realist theories of scientific progress argue that science approximates the truth, instrumentalist theories claim its results become more and more empirically successful. Nevertheless, both of these accounts abstract scientific activity from it social context and assume that science progresses. From an instrumentalist

perspective, Duhem (1954, p. 156) conceptualizes the progress of science as an approximation to empirical outcomes. Oppenheim and Kemeny (1956, p. 7) characterize scientific progress by asserting that empirically less successful theories can be reduced to more successful ones,i.e., this process of reduction implies a progression. From a realist perspective, Popper (1963) argues that scientific activity progresses through the falsification and corroboration of theories. Putnam (2010, p. 19) claims that we must assume that science progresses in its explanation of reality because otherwise the progress of its predictive and instrumental power is rooted in some sort of miracle. By arguing with epistemic optimism, Psillos (2005, p. 68) argues that we must assume that our best scientific theories approximate the truth. Although these schools have controversial views, both of them have something in common. They both take the notion of progress granted and they abstract scientific activity from its social context to demonstrate the way scientific progress takes place. Conversely, I investigate the social embeddedness of scientific production.

The sociology of knowledge emerged as an independent branch that examines the process of knowledge as a social process. Several works can be considered as the major canons of the sociology of scientific knowledge which try to ground the knowledge in the social reality from strong constructivism to laboratory studies (See Latour et al., 2006; Knorr-Cetina, 1983; Berger & Luckman, 1991; Bloor, 1981). All of these studies provide a social and historical account of both the knowledge in general and the scientific knowledge in particular. Grounding on the perspective of the sociology of knowledge, I approach the scientific practice not independent of social processes but embedded in them. I focus on scientific textbooks to see how scientific transformation and progress function in scientific common sense. Textbooks present canonized forms of scientific production and they can be suitable to examine narrations of transformation, in contrast to scientific activity in its abstract form. I examine whether there exists a narration of scientific transformation or not and if it exists how it is narrated. I examine the issue by focusing on the above-mentioned textbooks of Longhurst et al. and Beiser. I argue that there exists a continuity in the organizing principles on which analytical concepts are rooted in the previous and current scientific activities as narrated by textbooks. Nevertheless, I

also argue that these concepts multiply and become more particularistic in their narration.

## 1.1. Sociology and History of Scientific Knowledge: Methodological Considerations I

The dominant understanding of knowledge is built upon the assumption that it is objective. This understanding assumes that the scientific inquiry provides the ultimate truth or approximates it. Conversely, the historical and social studies of science and knowledge intend to show knowledge's embeddedness in the historical and social context. The issue of scientific transformation can be located in this context, too. While the traditional assumptions on scientific change ground themselves on the notion of progress, several others challenge this assumption.

### 1.1.1. Social Character of Knowledge

The Heideggerian notion of hypokeimenon is especially significant due to its focus on the paradigmatic shifts in the production of knowledge. Heidegger argues that "Metaphysics grounds an age" (Heidegger, 1977, p. 115), and this metaphysical ground in a specific era determines a specific conceptualization of truth along with its mode of appearance. That is, phenomena is not self-contained fact instead it appears in a certain era and according to certain rules. The relationship between socio-historical conditions and the mode of appearance of things can be seen more clearly in Lefebvre's comment that only the "pre-existence of an objective, natural and empty space" (1991, p. 34) can guarantee that entities appear as they are. The notion of space refers to the ground that determines the characteristics of entities (p. 34). Thus, the empty space leads to the conclusion that entities appear in their natural forms. In contrast to such an attitude, any historical work should specify limiting conditions that can be regarded as rules of appearance. These rules of appearance include the following: How certain phenomena are characterized as facts, how these facts are observed, what kind of methods are necessary for obtaining such facts, what kind of systematization of data is necessary for the production of knowledge, what are the essential characteristics of a theory to be accepted as true. Kuhn focuses on

the relationship between knowledge and socio-historical conditions in the particular context of scientific activity. He argues that it is not the case that there exists progress between different scientific paradigms but instead, they are completely different ways of looking at things (Kuhn, 1996, pp. 111-112).

Mannheim (1954, p. 3) emphasizes that thinking is not an individual activity but instead, its realization is conditioned by the group life. The concept of collective unconsciousness turns out to be crucial for the knowledge-production process for him (p. 36). Another significant account of the collective roots of knowledge can be found in Durkheimian analysis. Durkheim demonstrates the social embeddedness of the forms of intuition and the categories of understanding in the Kantian sense of the term. According to Durkheim (1995, p. 10), while the notion of time originated in the differentiation of a tribe's activities like that of profane and sacred, the notion of space is rooted in the spatial organization of the clan (p. 11). All other categories from causation to the principle of identity find their roots in the social organization in Durkheimian analysis (p. 8). Thus, knowledge in general turn out to be a function of social reality due to its foundation in such categories. According to Durkheim (p. 12) religious life in general or mythologies in particular which can also be equalized with the society *sui generis*, constitutes the characteristics of knowledge production.

Grounding on the mentioned theoretical frameworks, I analyze Longhurst et al.'s and Beiser's textbooks regarding the social embeddedness of knowledge production. This study does not approach these textbooks from the perspective of practitioners or abstract them from their social contexts but instead regards them as social phenomena. Thus, I do not intend to discover the internal contradictions of these textbooks but instead, I aim to find unconscious elements that shape the knowledge production process.

### 1.1.2. Modernity and Postmodernity

In addition to the traditional canons of sociology, the notion of postmodernity gains significance in the analysis of the current knowledge production regime and its canonization. Lyotard's comments are significant for understanding the

transformation of knowledge production in the contemporary world. He argues that science turns out to be “a moment in the circulation of capital” in this process (1984, p. 45). Here, Lyotard emphasizes that knowledge can no longer be justified by grand narratives (metaphysical systems of the nineteenth century) (p. 38). This leads him to the conclusion that increasing profit becomes the sole justificatory ground behind scientific activity (p. 45). Scientific means to generate knowledge have started to be more and more reliant on funding and this funding is provided by private companies (p. 45). Thus, he argues that the research activity was started to be funded by companies and the orientation of research is likewise determined by the interest of capital (p. 45).

Lyotard draws a significant shift between postmodernity and modernity concerning knowledge production. In describing the postmodern transformation of higher education, he claims that “The desired goal becomes the optimal contribution of higher education to the best performativity of the social system.” (Lyotard, 1984, p. 48). However, it can be questioned when the goal of knowledge production and dissemination is not organized according to “the best performativity of the social system”. Mucen et al. (2016, p. 9) argue that, not only in postmodernism but also in modernity, the question of knowledge was integral to the question of society and power. For example, Lyotard claims that “the striking feature of postmodern scientific knowledge is that the discourse on the rules that validate it is (explicitly) immanent to it.” (1984, p. 54). However, it is possible to find similar arguments in the critiques of modernity among canons of sociology.

Weber points out a similar problem regarding the legitimacy of knowledge within modernity. He argues that scientific activity has lost its meaning and cut its ties from the ‘eternal truth’ (Weber, 1949, pp. 141-142). Similarly, the mere meaning of scientific activity in the contemporary world finds its ground in practical applicability (p. 138). He relates this transformation to capitalism and bureaucratization (p. 131). These considerations can also be seen in Marx’s work but from a different angle. In the Marxist framework, the continuity of capitalism necessitates the reproduction of social relations in their totality. Marx (1978a, p. 207) argues that relations of production constitute social relations as a whole, namely

society. Knowledge production is also included in this totality of social relations For example, Marx (p. 211) argues that the increasing significance of calculation in knowledge production cannot be thought independent of the general conditions of capitalism. In his analysis of capitalism, Marx claims that knowledge's accumulation "is thus absorbed into capital" (1978b, p. 280). Thus, canons of sociology have already emphasized the relationship between capitalism and knowledge production in the context of modernity. Focusing on the methodological pretensions of these canons can provide better insight to understand the contemporary world.

### 1.1.3. Bringing Marx Back in & The Question of Ideology

The notion of ideology has a central place in Marx's work and this concept has affinities with the notion of common sense. This study's focus on common sense in the canonization of knowledge production renders Marxist analysis a significant methodological ground for the analysis. However, there exist several ambiguities concerning the notion of ideology in Marx's studies. It may be possible to approach this concept in relation to Marx's concepts of commodity fetishism. Marx argues that "All that is solid melts into air, all that is holy is profaned" (Marx & Engels, 1978, p. 476) while describing relations of production under capitalism. However, he also claims that capitalism brings about the fetishization of commodities described as "the fantastic form of a relation between things." (1978a, p. 321) Thus, the portrayal presented by Marx can be seen as a contradiction between becoming profane and fetishization. From this perspective, capitalism can be seen to eliminate older fetishes by creating new ones.

Several scholars approach the theory of ideology by relating it to the notion of 'commodity fetishism'. Barrett argues that "Traditionally it has been long recognized that the theory of 'commodity fetishism' in Capital is a theory of ideology in capitalist society" (1991, p. 15) when discussing the different meanings of ideology. Eagleton (1991, p. 30) also emphasizes this meaning by arguing that ideology can be read as lived relations expressed by 'commodity fetishism'. Zizek (2000, p. 56) suggests that the theory of ideology is not conceptualized as an epistemological concept but it is rooted in the social reality itself. In this definition of ideology, These

conceptualizations of ideology underline the effect of general conditions of production on the appearance of reality. Thus, these authors argue that it is not possible to go beyond ideology solely by conscious transformation because ideology is not rooted in consciousness but in the concrete practices and relations of society. In this sense, the social relations of production in a specific historical situation shape the social reality. Marx argues that "the human essence is no abstraction inherent in each single individual. In its reality, it is the ensemble of the social relations." (1978c, p. 145) However, Marx does not define these concrete relations as particular relations between individuals but they are seen as general conditions by him. Seve (2021, p. 301) argues that what is termed "relations" in the English translation of Marx's text is *Verhaltnis* instead of *Beziehung* in German. While the former means interpersonal relations, the second is closer to general conditions. Leve argues that Verhaltnisse means "not simply *the relationships between individuals* but social relations in their immense objectivity." (p. 301) In this respect, the transformation of ideology is not an issue of transformation of particular relations but instead necessitates the transformation of general conditions.

### 1.2. The Problem of Epistemological Obstacle and Common Sense: Methodological Considerations II

By analyzing textbooks, I problematize the narration of the break between common sense and modern scientific activity established by textbooks. I focus on Bachelard's and Althusser's theoretical frameworks in my analysis because of their contributions toward the epistemology of scientific transformation and the relationship between science and commonsensical intuitions. Bachelard presents the general dynamics of scientific transformation around the notions of 'epistemological break' and 'epistemological obstacle'. Althusser further presents a reading of these concepts in relation to the notion of ideology by embedding them in the social forces.

Bachelard (1968, p. 29) describes the history of scientific transformation from naive realism to surrealism via rationalism. According to him, naive realism comprehends entities as substances (p. 45). He defines 'substantialism' as the "prolongation of common experience" (p. 46). Thus, the notion refers to the commonsensical view of

reality. Bachelard (2002, p. 27) also defines obstacles as counter-thoughts that provide a sense of unity. According to Bachelard (p. 25), obstacles treat their objects as given and self-contained. Bachelard argues that "An epistemological obstacle will encrust any knowledge that is not questioned. Intellectual habits that were once useful and healthy can, in the long run, hamper research." (p. 25). In other words, he argues that the prolongation of science's past methods creates a conservative attitude toward reality by regarding reality for granted (independent of socio-historical circumstances) (p. 25). Thus, these past scientific ideas likewise become a part of common sense and they can be designated as scientific common sense.

Nevertheless, Bachelard mainly focuses on the internal dynamics of knowledge production, although these internal dynamics are still regarded to be embedded in specific social constellations. Bachelard's methodological emphasis is on the mechanisms of knowledge production. He argues that

> *Epistemologists have to take facts as ideas and place them within a system of thought. A fact that a whole era has misunderstood remains a fact in historians' eyes. For epistemologists however, it is an obstacle, a counter-thought. (2002, p. 27)*

Indeed, the notion of 'epistemological obstacle' necessitates a focus on the organization of knowledge on its own. He argues that it is the epistemologist's duty to approach the historical phenomena "from the standpoint of developed reason" (p. 27). Here, he uses the term developed reason to show the discontinuities and continuities of scientific production in its internal organization. According to Bachelard (p. 28), epistemologists must focus on the succession between concepts. Although he regards these successions as products of specific eras and their truth regime as mentioned, he still investigates the scientific transformation from an epistemological angle, from its internal organization.

Contributing to Bachelard's understanding, Althusser emphasizes the social embeddedness of Bachlard's notion of 'epistemological obstacle'. The notion of 'epistemological obstacle' has affinities with the Althusserian notion of ideology. He defines ideology as an "immediate material which spontaneously implies, looks for and naturally finds its forms in the image of a consciousness of self living the totality

of its world in the transparency of its own myths" (Althusser, 2005, p. 144). Here, ideology refers to the idea that the characteristics of the objects are immediate (p. 69). Immediacy can be seen as the assumption that the characteristics of objects are given independent of any social and historical reality according to Althusser (Althusser & Balibar, 1970, p. 17). Althusser (p. 19) argues that knowledge is assumed to merely reflect the inherent truth of objects in ideological immediate reading.

In Althusser's readings, there exists an affinity between ideology and previous scientific ideas and methods like Bachelard. Althusser argues that ideology "constitutes the pre-history of science". (Althusser & Balibar, 1970, p. 45) He describes every scientific attempt that aims to overcome ideology by referring to Bachelard's concept of 'epistemological break'. He asserts that the 'epistemological break' "establishes a science by detaching it from the ideology of its past and by revealing its past as ideological." (2005, p. 168). According to Althusser (p. 39), there exists a historical continuity between science and its past but also an epistemological discontinuity between these two. On the one hand, there exists a historical continuity between the previous and the current scientific activity. On the other hand, the epistemological discontinuity can be understood as that the previous scientific activity turns out to become a part of ideology (or common sense) and its position can be addressed by the term scientific common sense.

Following Althusser, 'epistemological breaks' create "a new theoretical conscious" (2005, p. 33). The notion of 'epistemological break' can be understood as a scientific attempt to construct a new reality out of ideological forms according to him (p. 81). Althusser also focuses on the issue of knowledge by regarding it as a separate instance but without disregarding its integration into the social totality. Knowledge production, or better put 'scientific instance', is not independent of other instances (such as political, economic, or ideological) but instead, scientific activity's problematizations appear in a conjecture composed of a contradictory system of other instances (Althusser, 1999, pp. 19-20). By emphasizing the notion of ideology, Althusser puts a further emphasis on the social character of scientific activity.

Therefore, I focus on Bachelard's and Althusser's frameworks to analyze the canonization of scientific activity and the narration of scientific transformation. Both of these theorists focus on the transformation of scientific activity. Bachelard prioritizes the concept of 'epistemological break' and 'epistemological obstacle' to investigate scientific transformation. Althusser further embeds Bachelard's concepts into the social reality around the question of ideology. In this regard, I study these textbooks within the methodological pretensions shared by Althusser and Bachelard. On the hand, the notion of 'epistemological obstacle' provides the necessary means to analyze the transformation of scientific activity. On the other hand, the concept of ideology is significant for analyzing this transformation by embedding it in the general transformation of social reality.

Nevertheless, both Althusser and Bachelard focus on scientific production on its own. In other words, these theorists do not examine the interaction between common-sense and scientific production but instead, they study scientific production as a separate instance. As mentioned, Bachlard adopts an epistemological approach toward scientific production by mainly focusing on the scientific production *per se*. Although Althusser further embeds Bechlard's notions into the social reality, he also examines the scientific production *per se*. Althusser argues that different instances have different modes of production (Althusser & Balibar, 1970, p. 52). He claims that knowledge production likewise includes its own specific mode of production (p. 41). Because of these pretensions, he mainly examines Marx's work by treating it as an instance of scientific production. In contrast to both Bachelard and Althusser, my selection of textbooks also includes another concern which is the canonization and institutionalization of knowledge production within higher education. The reason is that textbooks can reflect the crystallization of knowledge production mechanisms due to their pedagogical purposes.

Many authors regard textbook science as different from scientific production on its own. Kuhn (1996, p. 143) argues that the pedagogical purposes of textbooks shape layman's view of how scientific production works. Fleck (1979, p. 161) further positions textbook science in a vacuum between esoteric and exoteric circles of science because they are used for the introduction of the exoteric circle of the layman

to the esoteric circle of the scientific community. In these accounts, textbook science can be seen as the intermediary space between common-sense and scientific production per se. In this regard, textbook science both shapes and is shaped by the commonsensical view of scientific production. According to Apple, textbooks "participate in creating what a society has recognized as legitimate and truthful." (2000, p. 182). Textbook science is also shaped by political aims and market mechanisms in the view of Ross (2012, p.x- xi). Indeed, Jensen (2012, p.41) further relates this intermediary position of textbooks to Marx's conceptualization of ideology as the ideas of the ruling class because they both shape and are shaped by dominant ideas of a particular socio-historical conjuncture.

Thus, focusing on textbooks instead of direct means of knowledge production, like journal articles, gives emphasis on the canonization of knowledge production. In this regard, the concerns of this thesis depart from the concerns of Bachelard and Althusser. In contrast to these authors, I problematize the notion of 'epistemological obstacles' and break within the context of these textbooks devised for higher education for examining the relationship between scientific production and common sense.

### 1.3. Neoliberalism and the Privatization of Knowledge: Literature

The focus on the notion of ideology and common sense brings forth the question of the contemporary relations of production because these notions, as mentioned earlier, are rooted in social conditions. The notion of neoliberalism gains significance in this respect because neoliberalism constitutes the current regime of accumulation under the general conditions of capitalism in the contemporary world. The literature that takes neoliberalism at its center emphasizes the further commercialization of knowledge production and dissemination in the era of neoliberalism. They argue that the neoliberal accumulation regime has influenced higher education and institutions of means of knowledge production. Buchbinder (1993, p. 335) claims that the status of higher education that produce knowledge as a public good is replaced by knowledge's conceptualization as a marketable commodity. According to Margison (1993, p. 19), higher education is designed to market companies under the neoliberal

accumulation regime. Giroux (2014, para. 6) argues that the university's claim to truth is undermined by knowledge's service to the market.

The further integration of universities into the market also gave way to the transformation of the mode of knowledge production according to several scholars. Baker (2008, p. 37) claims that the 'super research university' turn out to be a major social institution within knowledge production. He relates this concept to the rising privatization of universities (p. 38). When discussing the transformation of higher education, Calvert dichotomizes 'basic research' and 'applied research' by defining them as follows: " 'General' research refers to research at such a 'level' that it applies to a wide range of instances or phenomena, whereas 'applied' research will help solve only a particular problem." (2004, p. 256) Thus, she relates this transformation to the increasing integration of university and private enterprise (p. 253). Rüegg similarly argues that the conceptualization of the university as an ivory tower collapsed with that the universities started to be controlled under "business-like administrative control systems" (2011, p. 15). According to Peat, this transformation "puts an end to that Enlightenment dream of conquering the world through pure reason." (p. 923) Tierney asserts that "Such indeterminacy is unsettling." (2007, p. 359) because "the university no longer is a site that seeks to develop a unified theory but rather it is a conduct for diverse conversations about the nature of a particular phenomena." (p. 362).

Although the clear-cut dichotomy between modern and post-modern truth regimes has problematic assumptions in Lyotrad's text, as was mentioned, some of his comments correspond to the emphases of these scholars. Lyotard (1984, p. 46) similarly underlines the rising importance of 'applied research' over 'basic research' due to the flow of funding into the former. According to him, 'hurried empiricism' characterizes knowledge production in the contemporary age (p. 52). Lyotard claims that although stable and deterministic systems are the main feature of modernity, they are replaced by unstable ones (p. 54). Conversely, contemporary knowledge production regimes rely on 'islands of determinism' according to him (p. 59). In other words, microcosmoses turn out to be the crux of research activity. Following this literature on the transformation of knowledge production, I also argue that

Longhurst et al.'s and Beiser's texts are in conformity with these authors' emphasis on the transformation of the higher education system and the increasing importance of 'applied research' of particular contexts instead of pure and general knowledge. I suggest that analytical categories multiply and they turn out to be more suitable for analyzing particular phenomena in these textbooks' narrations. However, I also argue that there exists continuity in the organizing principles (or epistemological obstacles in Bachelard's terminology) on which these analytical categories are grounded.

### 1.4. Tools of Analysis

I employ purposive sampling in this dissertation. I select a textbook from quantum physics and cultural studies due to the references given to these two theories in the explanation of postmodernity or the contemporary transformation of knowledge by several scholars. Indeed, these two disciplines constitute two major fields in which the break between the contemporary and classical forms of knowledge is emphasized by several authors. Lyotard (1984, p. xxiv) relates the condition of postmodernity with the collapse of structuralism and Newtonian physics and the overcome of these fields by poststructuralism and quantum mechanics respectively. Barad's (2007, p. 67) study likewise argues that poststructuralism and the standard interpretation of the quantum theory have commonalities. On the one hand, a modern physics textbook is selected for examining the narration of the difference between quantum mechanics and classical mechanics. On the other hand, a cultural studies textbook is selected due to the increasing importance of poststructuralism in the field of cultural studies as mentioned by Cusset (2003, p. 133). Although it is possible to see the effects of contemporary studies in many other disciplines of social sciences, cultural studies constitute the major field in which these studies are crystallized, especially in the case of poststructuralism and postmodernism. In conformity with this, the selected textbook of Longhurst et al. has various references to poststructuralist scholars. Thus, purposive sampling is employed due to the several references given to these two theories in the literature. Also, these two cases can be seen as an example of 'most-different' cases. Gerring and Cojocaru (2016, pp. 399-400) argue that 'most-different' cases are those that have the most divergence in background factors but are similar in their effects. On the one hand, completely different objects of study in

these textbooks constitute the divergence of background factors. On the other hand, they posit a similar narration of the discontinuity of 'epistemological obstacles' between classical and modern theories which can be seen as the similarity of effects in Gerring and Cojocaru's terminology. Here, Gerring and Cojocaru (pp. 397-398) argue that studies that involve 'most-different' cases can provide fruitful insights into the explanation of the outcomes due to their exploratory nature. These studies are also seen as insightful for argument testing according to these authors (p. 397).

Apart from the theoretical considerations, in the selection of these textbooks, I have read many other textbooks. This includes *Introduction to Sociology* textbook by Giddens et al. (2018), *Contemporary Social Theory* textbook by Anthony Elliott (2002), and *An Introduction to Quantum Physics* textbook by French and Taylor (1978). Nevertheless, I decided to focus on Longhurst et al. 's and Beiser's textbooks for several reasons. Although Giddens et al.'s textbook was also suitable for seeing the main tenets of the narration of transformation, it does not give enough coverage for the transformation of social sciences. Also, cultural studies, instead of sociology, is more suitable for this analysis due to the former's longer coverage of poststructuralism and postmodernism as the recent theoretical frameworks in social sciences. Although Elliott's textbook has huge coverage of these recent theoretical frameworks, the lack of empirical and methodological considerations in this textbook in comparison to Longhurst et al.'s leads me to eliminate it from the list. I decided to focus on Beiser's textbook instead of French and Taylor's in the field of physics because of the elementary nature of the former. Beiser (2003, p. xii), in the introductory section, says that his textbook is suitable for even students who have minimal knowledge in physics and mathematics. Therefore, I focus on Beiser books due to my lack of knowledge in these areas. Lastly, I consider the number of editions and the popularity of publishers in the selection of textbooks. Beiser's textbook has a total of 6 editions and it is published by *McGraw-Hill*. Longhurst et al.'s textbook has a total of 3 editions[1] and is published by *Pearson Education*. Although Longhurst et al.'s textbook's editions are relatively lower than Beiser's one, most of the textbooks in the area of cultural studies mainly use original excerpts from older

[1] Although the textbook has a total of 3 editions, I could only find the secod edition of it. Thus, I have used the second edition in my analysis.

theoreticians. Longhurst et al. (2008, p. xiii) also underline the lack of textbooks in the field of cultural studies. It is not possible for me to observe the narration of transformation in these original excerpts which are written decades ago. Thus, Longhurst et al.'s textbook is one of the most edited ones among the cultural studies textbooks I have checked.

Lynch and Bogen (1997, p. 482) argue that the sociology of knowledge adopts a reflexive attitude toward social research since it also reflects on the social analysis' own methods by challenging the traditional understanding of sociology. In this respect, reflexivity and criticality gain importance in such an analysis. From a reflexive point of view, my focus on both the subject of physics and cultural studies creates difficulties for me. My outsider position and lack of knowledge in the area of physics leads me to give intensive effort in understanding the textbook. Indeed, a friend of mine in the physics department has helped me to check the existence of any material errors. Not only physics but also the field of cultural studies also create some difficulties because of my insider perspective (due to the kinship between sociology and cultural studies) in contrast to my outsider position in the field of physics. This insider perspective leads me to question the 'epistemological obstacles' inherent in my field of inquiry. However, these 'epistemological obstacles' cannot be overcome by individual effort but they are embedded in the unconsciousness of the scientific community. Thus, it must be noted that this dissertation also includes similar 'epistemological obstacles' which I aim to analyze in these textbooks.

# CHAPTER 2

# STRUCTURAL VARIABLES OF AGE, GENDER, RACE, AND CLASS: THE PROBLEM OF EPISTEMOLOGICAL OBSTACLES IN HUMANITIES

## 2.1. Chapter Introduction

"In these chapters, and in the rest of the book, we are particularly concerned with the division of culture along the lines of class, race and gender." (Longhurst et al., 2008, p. 14)

"There is a risk, however, of running away with such geometrical metaphors of overlapping disadvantageous categories of class, race, gender and age." (Longhurst et al., 2008, p. 87)

In this chapter, I focus on the Longhurst et al.'s *Introducing Cultural Studies* textbook. In the textbook, Longhurst et al. narrate a break within the scientific activity. This break, as I show in the following section, is conceptualized from common sense to scientific common sense (exemplified in the older social theories), and lastly the current scientific activity by the textbook. Longhurst et al. first define the general common sense in reference to the notion of 'essentialism'. Thus, they construct the dichotomy between common sense and cultural studies on the ground of this notion of 'essentialism' by regarding scientific activity as anti-essentialist. Secondly, they further dichotomize the scientific common sense from the current scientific activity by arguing that previous theories reduce cultural complexity into plenty of structural variables. They draw the line between the traditional studies and the contemporary ones by regarding the latter as anti-reductionist. Therefore, their

conceptualization of firstly 'essentialism' and then reductionism[2] can be analyzed as 'epistemological obstacles' and their narration of break from these obstacles can be seen as an 'epistemological break', from the perspective of Bachelard and Althusser. As shown in the second quotation above, they relate reductionism to reducing social phenomena to a single social category like gender, age, race, or class. Their criticism toward 'essentialism' and reductionism follow similar lines of thought because Longhurst et al. argue that they both take a single category as the ultimate explanans of complex social reality. Longhurst et al. narrate a break from these categories. Nevertheless, I argue that there exists a continuity of 'epistemological obstacles' in their narration of contemporary cultural studies as shown in the first quotation above. Instead, I argue that similar 'epistemological obstacles' are still there but concepts anchored in these obstacles multiply and turn out to be more particularistic.

### 2.1.1. Essentialism and Reductionism

In their cultural studies textbook, Longhurst et al. identify 'essentialism' in terms of three main points. First of all, essentialists leave the differentiations within a group unexplained according to Longhurst et al. (2008, p. 121). For instance, essentialists may attribute main characteristics to a certain racial group and do not explain the different characteristics of people within this racial group. The trivialization of other different characteristics other than the main one lead to ignorance of these other differences (p. 121)[3]. Secondly, so-called essential features are based on over-generalizations according to them (p. 121). Overgeneralization refers to that they induce the characteristics of members within the group from a few of its members and generalize these features to all others in the group (p. 121). In other words, Longhurst et al. (p. 121) argue that one may generalize the traits of some people within a group, let's say again a racial group, to all other members by making overgeneralizations. Thirdly, essentialist approaches are based on a particular group's perspective but these approaches present themselves as objective and

[2] Although Longhurst et al. do not directly use the term reductionism, they use its verb form (to reduce) frequently when criticizing earlier theories. I decide to use reductionism in the noun form for the purpose of making reading easy.

[3] This reminds the dichotomy of essence and accident in which the accidental factors are merely ignored because their existence is not essential but contingent.

universal according to the textbook (p. 121). In other words, although essentialist approaches claim to present the objective and universal truth, Longhurst et al. argue that they serve the interest of a particular group, and their claims are limited to their particular experiences.

Longhurst et al. see a break from these essentialist approaches in cultural studies in contemporary works. They underline the increasing significance of differences and cultural complexities in contemporary studies against essentialist paradigms. They, further, assert that the earlier studies reduce everything to structural variables of age, gender, class, and race (Longhurst et al., 2008, p. 87). This assertion against the earlier studies can be seen as an extension of their criticism against 'essentialism' as I discuss throughout the chapter. They state that contemporary works overcome this perspective since they argue that contemporary studies do not reduce cultural complexities into the mentioned structural variables of class, gender, race, and age (p. 87).

### 2.1.2. Bachelard, Althusser, and Epistemological Obstacles in Cultural Studies

I approach Longhurst et al.'s narration of this transformation of scientific culture from the lenses of Althusser and Bachelard based on their focus on scientific transformation and the limits of scientific production. Although I discuss the contributions of Althusser and Bachelard in the introductory chapter broadly, I summarize the main points here as a reminder.

From Althusser's terminology, the dialectic between 'visible' and 'invisible' constitutes the basis for my analysis (Althusser & Balibar, 1970, p. 26). In the Althusserian schema, the invisible function as a constituent outside that determines the limits and the organization of visible (p. 25), or 'immediate sense' (p. 76) Immediacy, here, can be understood as regarding phenomena as natural and independent of the socio-historical conditions (p. 18). Althusser defines the scope of scientific activity as the appropriation of the visible field and the transformation of the invisible or historical terrain which shapes the appearance of phenomena (p. 54).

Similar to the Althusserian schema, as I discuss broadly in the introductory chapter, Bachelard (1984, p. 5) sees scientific activity as a transformative attempt against immediacy. Bachelard (2002, p. 245) underlines that previous scientific truths are transformed into intellectual habits in the evolution of scientific thinking, and constitute the underlying basis of 'scientific unconsciousness'. In this process, they function as 'epistemological obstacles' (Lecourt, 1975, p. 65). Bachelard (1968, p. 45) links this realist attitude with 'substantialism' in which 'the existing terrain' (in Althusserian terms or scientific unconsciousness in Bachelard's terms) shapes the appearance of phenomena as natural. That is to say, every phenomenon appears as natural, and this attitude ignores the constructed character of their appearance by the invisible terrain (by the historical conditions that limit and shape the appearance of phenomena). The scientific activity aims to create an 'epistemological break' with this 'substantialist' and realist attitude (this realism can be seen as the naturalization of the previous paradigm and transformation of the previous paradigm into an epistemological obstacle) (Bachelard, 1984, p. 237). This can be understood as the appropriation of reality by scientific activity in Althusserian terms. In other words, scientific activity aims at the transformation of the immediate sense by changing its terrain of appearance.

### 2.1.3. Epistemological Obstacles, Multiplication, and Particularity

I argue that, in Longhurst et al.'s narration, the essentialist and reductionist accounts can be regarded to contain 'epistemological obstacles'. They narrate the contemporary studies as a break from these obstacles as mentioned, Longhurst et al. (2008, p. 87) claim that contemporary cultural studies have overcome explanations that reduce everything to the structural variables of gender, class, age, and race by putting forward the irreducibility of cultural complexity to these categories. However, I argue that their framing of this cultural complexity is again explained in terms of the same structuralist variables which are rooted in similar 'epistemological obstacles'.

Conversely, I argue that there exists an extension of the previous reductionist approach and this extension can be seen in two main transformations. First of all,

these structural variables are treated to have an indeterminate constellation in different micro-level settings, in different places, and in different time periods. For instance, race can be more significant in certain places while gender and class can be more significant at any other time period. However, these structural variables are still regarded as universal and transhistorical variables that provide the ultimate explanation of everything. Secondly, agents (which may refer to individuals, social groups, or nations depending on the context of the textbook's discussions) are assumed to compete (in Longhurst et al.'s saying) within these structural schemas of inequality and they do not have a determinate and stable position. Their position is always variable and particular situations shape these positions because agents can always change their share by moving upward or downward within the structures of inequality. However, inequalities based on structural variables are always there because agents do not transform them but only change their own position and share. Thus, I argue that these variables turn out to be more particularistic and their multiplication according to particular settings becomes significant.

### 2.2. Culture as an Unexplained Complexity

Longhurst et al. criticize an established dichotomy between culture and social structure. They give the example of functionalism in which the culture is held in opposition to the economy and politics (framed as social structures) (Longhurst et al., 2008, p. 18). In Longhurst et al's reading of functionalism, while politics and economy are regarded as the base, the culture "oils the wheel of society." (p. 18). Longhurst et al. argue that this dichotomy is not limited to functionalist understanding which is assumed to be dominant and mainstream. However, Longhurst et al. also find this dichotomy in critical schools like Marxism and feminism (p. 18). I focus on Longhurst et al. criticism of these critical schools because they constitute a hard case (criticism toward mainstream paradigms like functionalism is less difficult than criticism toward them). In Longhurst et al.'s reading, culture maintains gender inequalities within the framework of feminism and it maintains inequalities between classes in the framework of Marxism (p. 19). In other words, Longhurst et al. see the reproduction of the base-superstructure metaphor in the dichotomy between culture and social structure in these two schools.

While traditional feminists are assumed to posit inequality among genders as the main social structure, traditional Marxists are seen to posit inequality among classes as the essential social structure. In other words, culture appears as a superstructure and these variables appear as bases in these schools according to the textbook. That is to say, Longhurst et al. present a criticism of the dichotomization of culture and social structure by suggesting that the above-mentioned perspectives see the former as a mere reflection of the latter.

### 2.2.1. Traditional Marxism and Reductionism

Although both of these criticisms are significant, I focus on their criticism of Marxism because of the wider space given to the earlier Marxists and the later criticisms of them throughout Chapter 3. In this chapter, Longhurst et al. present the orthodox reading of Marxism and criticize this understanding. According to them, Marx is understood widely within the dichotomy of base and superstructure (Longhurst et al., 2008, p. 68).[4] Longhurst et al. (p. 68) argue that, while base refers to economic relations, superstructure denotes cultural aspects. This differentiation is considered a way of dichotomizing culture and social structure and this dichotomy is widely criticized by Longhurst et al. (p. 18). In this dichotomy, Longhurst et al. (p. 67) argue that culture is seen as an ideology that serves the interest of the ruling class. In this argument, culture is regarded as a deception of real social conflicts (p. 67). Longhurst et al. assert that Marx (or better put his earlier readings) sees these social conflicts as the reflection of "the underlying economic structure of class inequalities" (p. 65). In their reading, Marx suggests that culture maintains this conflict by means of deception generated by the economically advantaged class (p. 65). For Longhurst et al., (p. 70) the main base is considered as the inequalities between classes by Marxists, and other factors are seen as mere reflections of this determining base. Longhurst et al.'s criticism of traditional Marxism (similar to his criticism of functionalism and traditional feminism) is based on the fact that Marxists cannot explain the complexity of the social reality because they reduce it to the social structure conceptualized as the deep-down inequality between as classes. The later

[4] Although Longhurst et al. (2008, p. 76) mention other interpretations of Marx, they mainly examine his traditional orthodox interpretation.

sections of the textbook are reserved for the criticism of this understanding (Sections 3.2., 3.3. and 3.4.), through which Longhurst et al. try to frame other approaches that transcendences this dichotomy.

Longhurst et al.'s criticism of traditional Marxism can be read in line with their criticism of unexplained differences. According to them, Marxists explain everything on the basis of a class-based inequality structure. This approach reduces cultural complexity into simple class positions and they attempt to challenge this attitude. If we locate this criticism in Bachelard's and Althusser's understanding, the main ground of their depiction can be more illuminatory. In Bachelard's terminology, how the concept of class is conceptualized by Longhurst et al. can be seen from the lens of the notion of 'epistemological obstacles'. The substantially constructed characteristics of the class (as an ultimate explanatory category that determines everything regardless of context) are regarded as the ground on which every phenomenon is shaped. The only reason behind the appearance of the phenomenon is explained by the notion of class and phenomena are only understood in their class-based characteristics. In this perspective, the structural variables (in this case it refers to class) can be seen as an 'underlying terrain' (in Althusserian terms) that shapes the 'immediate sense'. Phenomena can only become conceivable in reference to their class-based characteristics and their position in the class-based inequality schema. This problem constitutes the main basis of Longhurst et al.'s criticism and this criticism aims to break the reduction of empirical complexity into the variable of class regardless of context. This indifference toward context stamps the naturalization of class-based characteristics of entities. Conversely, Longhurst et al. try to break the 'existing terrain' of the 'immediate reality' by taking forth an approach that emphasizes difference and complexity. The notion of culture is conceptualized as a 'new terrain' for realizing this attempt to break the existing organization of the phenomenal world. To realize this aim, they frame diverse criticism of traditional Marxism and bring forth Weber's emphasis on the notion of culture.

### 2.2.2. Weber as a Pioneer of Attempt to Break Epistemological Obstacles

Although Longhurst et al. (2008, p. 70) refer to several names like the Frankfurt school and Gramsci, which are assumed to transcend the dichotomy between social structure and culture, they prioritize Weberian understanding due to its canonical role and the importance of the notion of culture in his studies. They state "The celebrated case here is Max Weber's" (p. 19) approach and argue that Weber's understanding "allows for the consideration of systems of inequality other than class." (p. 70) The concept of 'status groups' constitutes a significant basis of their reading. The notion of status groups is defined as a "style of life" (p. 69). In this understanding, 'status groups' cannot establish one-to-one correspondence with classes (p. 70). Instead, Longhurst et al. (p. 70) frame the Weberian conceptualization of status groups by the concept of regulation of practices within the same social groups. In other words, 'status groups' are not like classes because they are not conceptualized in the sphere of production but of consumption. The provided example is the case of English gentlemen who have to follow certain rules of conduct in their life and these practices signify their social status (p. 70). Longhurst et al. (p. 70) aim to further illustrate the significance of cultural complexity as much as structural variables by concentrating on the example of caste by arguing that castes constitute the most stabilized and characteristical organizations of status groups.

### 2.2.3. Castes as an Example of Status Groups

Longhurst et al.'s discussion of caste groups serves to illustrate the autonomous organization of culture which cannot be reduced to social structures like class. That's why, they repeatedly assert that it is not possible to find a direct link between classes or occupations[5] and castes (Longhurst et al., 2008, p. 71). Their intention is to demonstrate that it is possible to find complexity and differentiation which cannot be explained by social structural categories. Thus, Longhurst et al. (p. 71) criticize the traditional interpretation of castes which establishes a one-to-one correspondence between castes and class positions. The main aim of the textbook, here, is to find

[5] Although the notion of class and occupation can signify different categories, Longhurst et al.'s (2008, p. 69) employment of the term relates these two in the Weberian schema. Furthermore, they also establish links between Marxist term of class and Weberian one (p. 69).

another explanation that does not permit the reduction of complex cultural elements into structural factors (like class positions). Longhurst et al. (p. 71) then, assert that although castes are framed in major categories of Brahmins, Kshatriyas, Vaisyas, and Harijans; such a picture is assumed to mislead reality. In this traditional interpretation which is criticized by Longhurst et al. (p. 71), these groups are associated with certain occupations and class positions. For instance, while Kshatriyas are linked to warriors and rulers, Brahmins are seen as priests (p. 71). To criticize this interpretation, Longhurst et al. state:

> *Although these broad varnas are associated with occupation, in practice within a village there will be a number of occupations associated with a particular varna, so although the system is clear and unambiguous in principle, empirically there may be variety and complexity. (p. 71)*

To prove this argument, they refer to the concept of *jati* and describe them as "local subgroups of caste" (p. 71). Longhurst et al. assert that these local sub-groups are formed within a single village (p. 71). By using the concept of *jati*, Longhurst et al., again try to overcome the explanations based on social structures. Nevertheless, they do not provide any other explanation than relating *jati* groups with class positions. Thus, they define jati as "endogamous groups of kin who are associated with certain occupations" (p. 71). In this respect, *jati* groups are nothing but the further differentiation of castes into minor occupations. In this respect, they multiply castes into 23 sub-groups which are constructed based on occupational categories (p. 71).

If we turn back to the aforementioned theoretical frameworks provided by Althusser and Bachelard, Longhurst et al.'s framing of cultural theory constitutes a relapse into the 'existing terrain' of structural variables. Although they try to open up a 'new terrain' based on the cultural complexity, this 'new terrain' cannot be constructed and again reduced to the class positions. They try to overcome one-sided structural explanations by putting forward the local complexity of *jati* groups. However, the mere characteristic of *jati* groups is seen as their class positions and they are distinguished only by various occupations.

### 2.2.4. Reproduction of Epistemological Obstacles in the Case of Complexity

The notion of occupation functions alike to the conceptualization of class in Longhurst et al.'s narration. They celebrate Weberian analysis for distinguishing economic and cultural factors (p. 70). That's why, they also try to overcome an analysis that reduces castes into four main occupations as mentioned above (p. 71). Nevertheless, defining castes in terms of occupational categories is delimited by similar 'epistemological obstacles'. As mentioned, Longhurst et al. problematize 'essentialism' and reductionism by arguing that these sorts of analyses explain complexity by reducing it to a limited number of factors, namely structural variables. Thus, they argue that it is not possible to consider other factors that lead to complexities within groups from reductionist lenses (p. 121). For this reason, they argue that 'status groups' reflect the complexity and this complexity cannot be reduced to economic factors like class position or property ownership (p. 70). This leads to their assertion that four castes cannot be reduced to four occupations (p. 71). For overcoming this account, Longhurst et al. claim that Indian villages are locally complex (p. 71). In other words, there exists not only four groups but plenty of them, if one studies these villages in an in-depth way. However, for overcoming this reductionist account, they only argue that twenty-three rather than four castes exist in Indian society (p. 71). Thus, they only increase the number of caste groups but these groups are likewise defined in terms of their occupational differences. According to them, these twenty-three castes have other consumption practices (as they defined 'status groups' according to the regulation of practices) (p. 71). However, the regulation of practices is conceptualized as, again, the function of caste groups, and these caste groups are determined by their occupations (p. 71). Occupations are the main explanatory variables behind the different castes. Different practices of castes reflect the complexity in Longhurst et al.'s narration. However, occupation as a structural variable is framed as the only reason behind this complexity. Therefore, the complexity is again reduced to a structural variable of occupation. Thus, they reproduce the base-superstructure metaphor because occupation as a structural variable is the base on which the superstructural cultural complexity is grounded on. In this way, they reduce the differentiation of practices between castes into different

occupational categories. Either way, cultural complexity is explained in terms of structural factors.

Thus, Longhurst et al. try to criticize the essentialist and reductionist accounts by asserting that these accounts do not explain differences in cultural complexity. For criticizing this attitude, they frame traditional Marxism within the base-superstructure metaphor and regard this understanding as reductionist. For overcoming this, they refer to the Weberian concept of 'status groups' and criticize accounts that reduce 'status groups' into classes. They exemplify the difference between these two terms in the context of castes. However, they also argue that it is not possible to reduce castes into four main occupations by putting emphasis on the complexity of practices in various caste groups. Although these practices represent cultural complexity, they again explain the cultural complexity in terms of various castes which are defined according to the occupations. Longhurst et al, as above-mentioned, aim to define cultural complexity by emphasizing its irreducibility to the structural variables. However, they reduce and define jati groups merely with respect to the same structural variables. The number of castes rises and they provide a more detailed analysis but this analysis is only detailed in the ground of structural differentiation based on the nation of occupation. These structural variables (occupation) are regarded as the main determinant of this cultural complexity. The only difference between the structural analysis criticized by Longhurst et al. and their own analysis can be seen in their further multiplication of castes and sub-groups. Thus, similar 'epistemological obstacles' can be seen in their analysis but the concepts rooted in these 'epistemological obstacles' multiply.

### 2.3. Locality for Overcoming Overgeneralization

According to Longhurst et al. (2008, p. 77), class, gender, race, and age constitute the major variables of inequality embedded in the structure. However, they state that cultural studies must overcome explanations that generalize everything into these structural variables in order to open a space for complexities (p. 83). This perspective can be read in line with their criticism against overgeneralization because overgeneralizations, as mentioned, likewise ignore complexities by generalizing

particular characteristics to the whole group. Thus, Longhurst et al. assert that "There is a risk, however, of running away with such geometrical metaphors of overlapping disadvantageous categories of class, race, gender and age." (p. 87) For overcoming such an approach, Longhurst et al. attribute significance to the notion of locality.

### 2.3.1. Foucauldian Notion of Power and Locality

For overcoming the possible risk of overgeneralization, Longhurst et al. bring forth the Foucauldian notion of power. They see Foucaldian understanding of power as an antidote against structural explanations by framing it as that power operates in a capillary form (Longhurst et al., 2008, p. 87). They interpret this assertion as a local understanding of power in contrast to the structural one in line with the section's title of "Structural and local conceptualizations of power" (p. 86). To describe this local conceptualization, they state as follows:

> *For instance, we may sometimes feel ourselves to be badly treated by a shop assistant. Is this because of our race or class or gender or age? In actual instances the answer can be very variable for any given person, so it can be very difficult to pin down which particular source of disadvantage is operating. This difficulty does not deny the reality and force of these disadvantages. But it does serve to further underline Foucault's fundamental point about the omnipresence of power and resistance: dominations of class or race or gender are never complete or total and can be challenged in the conduct of our everyday lives. (p. 87)*

This paragraph illustrates how Longhurst et al.'s conceptualization of the Foucauldian notion of power as a locality is grounded on two main arguments. The first argument is built upon the particularity of local contexts. Here, local is used for describing microlevel complexities because it focuses on a particular behavior (bad treatment) of a particular agent (shop assistant) in a particular environment (in a shop). This imaginary case is constructed to argue that it is not possible to generalize these structural variables to any particular situation or better put any micro-level situation. According to this argumentation, it is not possible to find a general explanation for a specific bad treatment and every different bad treatment cannot be generalized to a structural category. Secondly, the local conceptualization of power is also framed in such a way that it refers to the possibility of challenging the mentioned structural categories. Therefore, these categories are framed as incomplete

due to the constant process of challenge and resistance. Nevertheless, as I show in the following paragraphs, these two arguments are again determined by four structural variables.

Longhurst et al. use two studies for describing local and complex characteristics of power. These are “Malcolm Young’s study of the police (1991) and Sallie Westwood’s study of Asian women garment workers (1984)” (2008, p. 87). Longhurst et al. refer to the Westwood study for two main above-mentioned purposes. Firstly, a category (class position of police workers and garment workers) is depicted in this narration, not as homogenous but there can be complex relations in different micro-level localities according to them. Secondly, Longhurst et al. argue that inequalities rooted in structural variables are always open to challenge and transformation. Longhurst et al.’s framing continues as follows: in Westwood's study of workers in a specific factory, power relations in the workplace cannot be reduced to class positions because while managerial workers are mainly composed of men, manual laborers are women (p. 87). There exists different access to resources (such as payment and allowances) between men and women and women workers develop specific tools for challenging the managerial power of men to increase their share of the resources (p. 87). Longhurst et al. framing of Young’s study likewise follows the same lines of thought. As Longhurst et al. narrated, this study is held in a specific setting of the police office, and officers are not likewise treated as mere occupants of class positions but there exists differentiation between women and men (p. 87). These differentiations create gender-based inequalities and women officers challenge male domination, again with specific tools (p. 87). In both of these descriptions, the structural category of the class is seen as insufficient for the explanation. However, this explanation is only expanded by another category, namely gender. Thus, structural variables are not withdrawn in favor of cultural complexities but the latter is reduced to the specific constellation of these structural variables in particular micro-level localities. In other words, Longhurst et al. cite these two studies for showing the irreducibility of local complexities to the structural variables but they can only explain and ground these local complexities in the same structural variables. This time structural variables are not taken singular but their different intersections turn out to be significant in various particular local contexts. Similar to Longhurst et

al.'s criticism against structural generalizations, these structural categories are constellated and overlapped in various ways in different settings and the complexity is subsumed under these variables. However, their various constellations under specific settings are still indeterminate because every particular setting is subjected to another constellation of them. For instance, gender-based hierarchies can intersect with class-based ones in a particular setting while they are intersected with racial hierarchies in another setting in Longhurst et al.'s narration.

### 2.3.2. The Possibility of Challenge of Structural Variables

Another prominent feature of Longhurst et al.'s emphasis on local complexity finds its justification in the possibility of challenging structural inequalities by agents. They argue that structural variables are not fixed and stable but are always constructed and re-constructed by the performance of agents (Longhurst et al., 2008, p. 147). Longhurst et al. suggest that various forms of protests disrupt these structural positions. It is not possible to see these structural variables as complete and decisive. Longhurst et al. exemplify this disruption by referring to Bakhtin's understanding of carnivalesque (p. 149). In Longhurst et al.'s (p. 149) portrayals, carnivals are seen by Bakhtin as stages in which the structural inequalities are subverted. They state that the carnival "turns the world upside down. At the carnival, kings become fools and fools become kings. What lies behind the carnival is not just disorder but a conception of an alternative order." (p. 149) As seen in this quotation, carnivals are depicted as a possibility of imagining alternatives but this alternative is only conceptualized as a reversal of structural positions. While structural positions are depicted as simply there, any challenge can only change the position of agents in this structural matrix.

Longhurst et al. exemplify the possibility of challenge in various examples but I focus on two of them due to their correspondence to the two major mentioned structural categories of gender and class. While describing queer theory and politics, they give the example of "the male drag artist" (Longhurst et al., 2008, p. 148) which, according to them, challenges the structural inequalities. In the second example, they emphasize an upper-class politician's clothing (Michael Foot) which

resembles a working-class outfit. The politician wears this outfit in a formal setting composed of other upper-class politicians (pp. 153-154). It is possible to see the logic of upside-down in both of these examples because agents are simply there and they can change their positions via the structural lines. In the first example, the male drag artist is assumed to challenge gender norms (p. 148). However, the challenge merely occurs in the change of position along the lines of gender since the challenge is grounded on the same structural variables. Drag performance is connected to a feminine activity and the artist's being male is contrasted with this feminine attitude. Thus, they assume that this performance subverts the structural line of gender. However, it only changes the position of agents in the same gender structure. A male artist only gives up a masculine attitude and adopts a feminine one. Although the artist's position changes, the change is again grounded on the same assumingly masculine and feminine attitudes. In the second example, the class lines are again stable and the challenge only changes the agents' position in these structures. The category of the politician is associated with the upper-class position. This upper-class position is linked with a particular type of outfit and all other politicians in this particular setting are depicted to wear this type of outfit. A politician's (Michael Foot) clothing in a particular setting then is associated with working-class dress. Then, Michael Foot's working-class outfit and other politicians' upper-class outfits are seen as a form of subversion. However, the narration of the subversion is again based on the same structural variables and associated clothes. Although Michael Foot's position changes, the change is again grounded on the same assumingly upper-class and working-class outfits.

### 2.3.3. Reproduction of Epistemological Obstacles in the Case of Locality, Particularistic, and Multiplied Concepts

While Longhurst et al. aim to overcome the explanations that reduce everything to structural variables and overgeneralize these variables to ignore cultural complexities, they ground their understanding in similar lines of thought at the end. From Bachelard's framework, their criticism toward structural reductionism corresponds to an 'epistemological obstacle' because they argue that generalizing cultural complexities in various micro-level localities to four main structural

variables are a sort of reductionism. These structural variables, for them, appear like substances that can be applied to every micro context and they attempt to break this reductionist approach. Nevertheless, their aim to break this obstacle cannot be understood as an effective attempt instead, there exists a continuity between the narration of the previous paradigm and their approach because they still rely on the same structural variables. However, it is possible to observe two main transformations. First of all, structural variables multiply and the phenomena are explained not in reference to one structural category but instead their different constellations in various localities. Secondly, agents have ascribed positions in these structural inequalities but they can also be assumed to challenge the existing unequal schemas.

From an Althusserian (2000, p. 18) point of view, scientific production constructs its own object of study. In both of these transformations, it is possible to see that concepts turn out to be multiplied and become particularistic. In the first transformation, age, gender, age, and class are assumed to have various constellations within different local circumstances, and their constellation is subjected to particular contexts. Thus, the researcher must analyze every particular situation to discover how these structural variables are constellated. This departs from the earlier approaches criticized by Longhurst et al. For instance, they narrate Marxism as a framework that approaches the phenomena from a deterministic point of view (Longhurst et al., 2008, p. 65). In this narration, other structural variables other than class are not treated structurally but instead, they are assumed to be determined by the class positions (p. 68). Similarly, Longhurst et al. assert that traditional feminists ignore the differentiations of power inequalities between various cultures and the universal nature of gender inequality is assumed to be determined in every other cultural context (p. 82). In contrast to this perspective, they favor various constellations of these structural variables in different particular micro-level localities. However, it is possible to find continuity within the reductionist approach because everything is reduced to these structural variables. Their different constellations multiply in various particular settings and this change can be related to a further crystallization of the existing ‘epistemological obstacles’ (structural variables).

In the second transformation, agents are assumed to have various positions in the schema of structural inequalities by Longhurst et al. Nevertheless, agents are narrated in such a way that they cannot transform the structures *per se* but only change their or other agents' positions in these structural schemas. The change of position brings forth a transformation of the share of resources by agents. However, the same resources (in the case of Young's and Westwood's study) or attributes (in the case of the male drag artist and the politician with a working-class outfit) are still organized according to the structural variables. The mentioned *jati* groups in the previous main section are likewise categorized according to this capacity to challenge by Longhurst et al. They argue that horizontal mobility is a possibility between castes since some *jati* groups adopt the practices of higher-ranking castes and their ranks are increased in the schema of inequality (Longhurst et al., 2008, p. 71). However, what we see is again only the transformation of agents' position in the same structural lines of inequality. Thus, it is again possible to find continuity of the similar 'epistemological obstacles' since structures are still there and cannot be overthrown. However, agents' positions in the structural schema are constantly subject to change and analysts must consider the multiplication of structural variables in various particular settings. Thus, concepts turn out to be multiplied and become particularistic in both of these transformations. Nevertheless, these transformations are not sourced from a major 'epistemological break' within the system of knowledge; instead, the previous 'epistemological obstacles' are still there.

### 2.4. Particular Perspective and Transhistorical Perspective

Longhurst et al. (2008, p. 6) argue that the notion of truth is not objective and universal but it is subjected to change across different times and spaces. They discuss the notion of cultural relativism by signifying the richness and complexity of every other culture (p. 6). They say that "our knowledge of the world is inevitably perspectival. The perspectival view of the world complements the issue of cultural relativism" (p. 6) According to their criticism, a particular image and conceptualization of the world are rooted in specific experience rooted in a particular cultural context (p. 6). For instance, they frame studies in which Shakespeare's cultural value is seen as the function of English imperialism in their canonization of

less developed parts of the world (p. 15). Similarly, Longhurst et al. refer to many novels in which the cultural imaginary is rooted in the Western perspective and imposed on other parts of the world (p. 6). They exemplify this problem in Joseph Conrad's novel Heart of Darkness in which Africa is depicted from the perspective of European colonial powers (p. 6). This presentation of the partial nature of images and truth can be seen as the continuation of their third criticism against 'essentialism' (in which they argue that universally assumed characteristics of essentialist characterizations are actually grounded on the perspective of a particular group as I discuss in the first paragraph of this chapter). Conversely, they emphasize the significance of various cultural contexts and their complexities by discussing this issue in various examples. This time the concept of locality is not related to the complexity of micro-level settings but the complexity of other cultural geographies and time periods.

### 2.4.1. Western Middle-Class View of Children and Other Parts of the World

They assert that the value and conceptualization of children in the dominant Western imaginary are rooted in a specific middle-class experience (Longhurst et al., 2008, p. 14). In this image, children are seen as receptors of resources, and these resources "flow in a one-way direction" (p. 14) from parents to children. They argue that this middle-class perspective cannot be generalized to the whole society (p. 14). Indeed, this criticism constitutes another example for the previous section because they assert that age (in this case the value of children) is not sufficient for explaining the complexity of cultural phenomena. However, they only intersect the structural variable of age with that of class position (in this case middle-class experience). Thus, they reduce cultural complexity into various constellations of these structural variables within a single society. However, they go one step further here by not only analyzing Western society in these structural variables but also including other cultures in different historical periods and geographical spaces. They argue that this middle-class imaginary is Western-based and it is imposed on other cultural geographies but these geographies are culturally complex and cannot be reduced to the same structural variables (p. 14).

Longhurst et al. (2008, p. 14) argue that the mentioned Eurocentric image of children cannot be taken as an objective perspective but children have various positions in different cultures. In other words, it is not possible to impose what Westerners understand from the category of age on other cultures. They suggest that in many different historical periods and in various geographies children are not just passive receptors but they are contributors to the family economy (p. 14). By referring to Claddwell's study, they insist that there exists "a 'reciprocal flow' of goods and services between parents and even quite young children." in many other cultural geographies other than the Western one (p. 14). That is to say, they criticize particular Western images of children but they only reorganize this image by transforming the position of agents (children in this case) within their share of resources grounded on the structural variable of age (resources no longer flow one-way but there exists a reciprocal flow). By doing so, Longhurst et al. refer to the same structural variables and apply them to any other historical and cultural context. These structures appear like universal and timeless categories of explanation in contrast to their criticism toward the perspectival nature of knowledge.

### 2.4.2. Hybridity and Intersection of Cultures

Their discussion of Orientalism and hybrid cultural forms brings forth a similar line of problems. Longhurst et al. (2008, p. 127) argue that cultural products do not belong to specific cultural contexts but are products of interaction between various cultural elements. For instance, British tea is widely seen as a product of British culture and the Britishness of this product appears as natural (p. 128). However, it is

> *"made of leaves from China, India or Sri Lanka, sweetened with sugar from Caribbean plantations worked by African slave labour. Again, it is a hybrid that renders notions of an essentialized and localised 'Britishness' or 'Englishness' very problematic." (p. 127)*

In other words, they argue that cultural products (in this case food) are not a product of specific culture, and such a conceptualization serve the interest of British imperialism (p. 127). However, they locate this image as the intersection of ethnicity[6] (British ethnicity for instance) and class (slave labor in different parts of the world).

[6] Longhurst et al. (p. 80) discusses the notion of ethnicity under the category of race and only differentiate them according to how they are used by different groups. While race is seen as a catogry used by laymen in a racist manner, ethnicity is mostly seen as an academic category (p. 80). However, they are not differentiated in the level of meaning (p. 80).

For describing various cultural goods, they frequently refer to the notion of hybrid or diasporic for describing them (p. 129). However, what makes them hybrid or diasporic is again the different application of these four structural categories into various cultural contexts and historical periods.

Similar to the previous section, Longhurst et al. also discuss the notion of resistance in the context of the imposition of a certain image toward others. They give the example of Mecca-Cola for this case by stating that

> *"charity-business selling a drink called Mecca-Cola has been set up to encourage Muslims to reject the materialist capitalism of Coke, and to channel the profits from its Islamic soft drink to supporting the Palestinian cause." (Longhurst et al., 2008, p. 129)*

They suggest that Mecca-Cola is not solely the product of the US but instead, it exists in the intersection of the US cola and the Islamic identity (p. 129). These goods are seen as the product of the hybridization of different identities. Subaltern identities are always assumed to challenge the existing inequalities rooted in the structural schema. However, this challenge only directs the flow of resources from one way to another without altering structurally rooted inequalities of race, class, gender, and age. Cola as a product is attributed to a particular culture (the US in this case) and Mecca as a place is attributed to another culture (Islamic identity in this case). The hybridization of these two attributes is seen as a form of subversion. However, the same attributes are still divided along the same structural lines of inequality between different cultures (or ethnic groups). The change only occurs in the transformation of agents' positions (Islamic society and Western society in this case) and different share of resources in accordance with this change of positions. However, the same structural variables are still there and the same properties are attributed to these variables.

### 2.4.3. Reproduction of Epistemological Obstacles in the Case of Perspective, Particularistic, and Multiplied Concepts

If we locate this criticism and examples in the schema provided by Althusser and Bachelard, Longhurst et al. again aim to raise a criticism toward the 'epistemological obstacles' rooted in the 'substantialist' reading of cultural images. They aim to subvert the universal and ahistorical schemas by locating the notion of knowledge to

a particular cultural perspective (for example Western imagination). Nevertheless, they aim to show the complexity of other imaginations by only referring to the various constellation of these structural variables in various contexts. Structural variables are assumed to be simply there in an ahistorical and universal fashion but only constellated variously across time and space. These structural variables conserve their ‘substantialist' character because they are seen as a natural way of analyzing every other geography and time period. Likewise, the possibility of the challenge is only conceptualized in reference to the transformation of the position of agents in structural lines of inequality. This transformation of structural positions of agents in these variables leads to the increase or decrease of resources but structural inequalities are depicted as simply there at every time and place. Also, the same attributes are scattered along these structural lines of inequality as if these attributes are universal characteristics of these structural positions. While these categories are applied to every particular micro-level phenomenon in the previous section, they appear universal and ahistorical in their applicability to every other cultural context regardless of historical period or geography in this time. However, the employed concepts turn out to be particularistic and their constellations multiply in various particular cultural localities.

## 2.5. Chapter Conclusion

This chapter frames Longhurst et al.’s narration of social theory based on their criticism of ‘essentialism’ and reductionism. This criticism includes three main arguments as follows: they argue against the inability to explain differences within a group, the overgeneralization of particular traits to the whole group, and the perspectival nature of knowledge. By emphasizing the significance of these three categories, Longhurst et al. bring forth the notion of culture for pointing out the complexities of social phenomena. Thus, they criticize ‘essentialism’ by arguing that essentialists reduce cultural complexities into plenty of factors. Furthermore, their criticism of reductionism also follows the same lines of thought. They argue that reductionists also reduce cultural complexities into four main structural variables of gender, race, age, and class. While ‘essentialism' can be seen as common sense, reductionism can be regarded as scientific common sense as part of the former. In

this regard, they narrate the earlier perspectives in social sciences and humanities as ones that reduce cultural complexity into structural variables. Conversely, they narrate a break from these perspectives in contemporary studies in which cultural complexity is taken into account.

However, I argue that similar 'epistemological obstacles' are still there because concepts used by them still follow the similar underlying logic of the previous 'epistemological obstacles'. In the first section, I argue that although Longhurst et al. suggest that structural variables of class, gender, age, and race are not sufficient for analysis of the cultural complexities, they again ground the cultural complexities in reference to the same variables. This leads to the commitment to similar 'epistemological obstacles' in which structural variables are rooted. However, analytical categories multiply (as in the multiplication of castes into 23). In the second section, I show that Longhurst et al. bring forth the complexity of micro-level cultural phenomena and argue with its irreducibility to the structural variables. This argument is related to their criticism against overgeneralization because cultural complexities of the microlevel phenomena are assumed to be overgeneralized into the structural categories of gender, class, age, and race. Nevertheless, I argue that these micro-level cultural complexities are again explained by reference to the same structural variables. Nevertheless, the employment of these structural variables extended, and microlevel phenomena are explained in the particularistic constellation of the mentioned four variables in various micro-level localities. Similarly, the positions of agents are varied due to the constant transformation of their position within the structural lines of inequalities. Thus, I argue that similar 'epistemological obstacles' are still there in this case, too but different constellations of concepts are subjected to particular contexts and these constellations multiply. In the third section, I show that Longhurst et al. bring forth the complexity of various geographical contexts and historical periods which cannot be reduced to the structural variables. This criticism is based on Longhurst et al.'s assertion of the perspectival nature of the truth because they argue that the contemporary Western-based categories and meaning systems are universalized and imposed on both other historical periods and other cultures. Nevertheless, I argue that they similarly apply the four structural variables by universalizing them to other historical periods and cultural geographies.

However, I also argue that the constellation of these structural variables multiplies according to particularistic contexts.

To sum up, I have put forward two main arguments. First of all, although Longhurst et al. narrate a break from the previous theories, there exists a continuity due to the employment of the same structural variables. Thus, similar 'epistemological obstacles' are still there in Longhurst et al.'s narration of the transformation of cultural studies. Secondly, the employment of the categories or their different constellations multiplies and turns out to be subjected to particular circumstances.

# CHAPTER 3

# UNIVERSAL AND ABSOLUTE: THE PROBLEM OF EPISTEMOLOGICAL OBSTACLES IN PHYSICS

"The certainties of classical mechanics are illusory" (Beiser, 2003, p. 162)

"Two fundamental constants are involved in general relativity: the gravitational constant G and the speed of light c. Similarly, Planck's constant h is the fundamental constant of quantum theory." (Beiser, 2003, p. 499)

## 3.1. Chapter Introduction

Arthur Beiser, in his modern physics textbook, argues that the directions of modern physics[7] are entirely different than classical physics[8] and common-sensical intuitions. He asserts that "Because the ideas of modern physics represented totally new directions in thought when first proposed, rather than extensions of previous knowledge" (Beiser, 2003, p. xii). He differentiates modern physics from both common sense and classical physics with respect to the notion of universality and absoluteness (p. 3). In the first section of the book, he discusses the issue of frame of reference for showing the overcome of universality and absoluteness (p. 2). This concept of the frame of reference functions as a reference point in describing and observing physical phenomena (p. 2). For instance, one can say that something is moving only in reference to a specific frame of reference like a stationary body. In the other sections, when he discusses quantum physics, physical phenomena are no longer absolute even in a specific frame of reference. According to the textbook,

[7] It refers to both Einstenian special relativity and the later quantum mechanics.

[8] Although Beiser mainly refers to Newtonian physics when mentioning classical physics, it can, occasionally, refer to the Maxwell's theory of light.

even in the condition of specific observation and frame of reference, bodies have an ambiguous nature in quantum mechanics (p. 113). Beiser (p. 111) argues that the inherent nature of the universe is indeterminate and ambiguous in the contemporary conceptualization of physics.

### 3.1.1. Absoluteness and Universality: Frame of Reference, Uncertainty, and Indeterminacy

Breiser asserts that "There is no universal frame of reference that can be used everywhere, no such thing as 'absolute motion'"(2003, p. 2). For Beiser, this understanding contradicts our everyday common-sensical view of the world in which speed is conceived as absolute (p. 3). For instance, we can assume that a car is traveling at 100 kilometers per hour and this knowledge is not based on the velocity of a specific observer but absolute. According to Beiser (p. 2), classical physics also contradicts universality and absoluteness to some extent. For example, classical physics likewise includes the theory of relativity[9], for example of movement, but it continues absoluteness and universality with respect to time (p. 5). Classical physics does not posit the universality of time. He argues that the descriptions and observations of classical physics work with a universal and absolute frame of reference with respect to time (p. 5). Conversely, the time for a moving body depends upon another body from the point of view of special relativity in the text (p. 5).

Furthermore, Beiser does not only differentiate classical physics from special relativity in reference to the issue of universality and absoluteness but quantum physics is also conceptualized with the same terms. As shown in the first quotation in the beginning ("The certainties of classical mechanics are illusory"), Beiser argues that quantum physics goes beyond the absolute and universal certainties of classical physics. These certainties turn out to be collapsed in the case of quantum mechanics (p. 55). According to the textbook, quantum mechanics goes beyond special relativity by rendering phenomena not only relative to frames of reference but

[9] While the theory of relativity refers to the relativity of three dimensions according to an observer, special relativity includes time as another relative dimension in this picture.

physical phenomena turn out to be relative to every specific act of observation. Indeed, according to Beiser (p. 111), it is no longer possible to argue that physical phenomena have a nature independent of our observation. The notion of observation constitutes the main ground of the uncertainty principle and wave-particle duality in quantum physics that I discuss later on (While wave-particle duality constitutes the main content of the second section, the uncertainty principle constitutes the main focus of the last section.) (p. 96).

Thus, Beiser narrates a break between the commonsensical understanding of reality in physics. He conceptualizes this break in relativity by referring to the concept of the frame of reference. This notion leads to the collapse of absolute and universal space. Secondly, he narrates a break from classical physics by following a similar logic. He argues that although the notion of time is still absolute and universal in classical physics, it is overcome in special relativity. That is to say, the notion of time turns out to be dependent upon a specific frame of reference. Furthermore, he argues that the notion of a frame of reference is not sufficient for describing the collapse of absoluteness and universality in quantum mechanics. According to him, in quantum mechanics, not only physical phenomena is relative to a specific frame of reference but it also depends upon every act of observation. Therefore, he argues that universality and absoluteness are completely collapsed in the case of quantum mechanics.

### 3.1.2. Absoluteness and Universality as Epistemological Obstacles and Common Sense Knowledge

I approach Beiser's depiction from the point of view of Bachelard and Althusser because both of these theorists also conceptualize scientific activity through the lenses of breaking from the commonsense as I mentioned. Althusser and Bachelard put specific attention to the notion of observation by referring to the dichotomy between observer and observed. Althusser argues that the empiricist conceptualization of knowledge is based on a 'mirror myth' (Althusser & Balibar, 1970, p. 19). According to Althusser, this myth is based on the conceptualization of knowledge as a relationship between the knower subject and the known object (p.

17). According to him, the subject aims to find the true essence of a thing from its particular observation or explanation (p. 17). In other words, knowledge is conceptualized as the correspondence between the reflection of the given object in the given subject's mind. Instead, science departs from this empiricist myth and produces its own object of knowledge according to Althusser (p. 42). He conceptualizes it as an 'epistemological break' through which science overcomes ideological conceptualization (p. 45). Here, ideology denotes the pre-history of science (p. 45).

Similar to Althusser, Bachelard (2002, p. 237) argues that there exists a break between scientific and sensory knowledge. In his schema, previous scientific discoveries are reduced to common sense and create 'epistemological obstacles' (Lecourt, 1975, p. 65). Science aims to break from these obstacles (Bachelard, 2002, p. 24). Bachelard (1984, p. 5) conceptualizes modern science as an attempt to break this empiricist conceptualization of reality. According to him, modern science overcomes the Cartesian conceptualization of knowledge (in which knowledge is reduced to the correspondence between the reflection of the given object on the given subject's mind and the object's reality in itself) (p. 138). He argues that modern physics breaks from the 'epistemological obstacles' rooted in classical physics (Bachelard, 1968, p. 29). For instance, Bachelard (1984, p. 139) states that bodies are not prior to the observations in quantum. In other words, they do not have given essences *per se* but they are shaped by the theory-building and observation processes.

I argue that Beiser's distinction between modern physics and classical physics fits into Althusser's and Bachelard's understandings of 'epistemological obstacles' and an 'epistemological break' from these obstacles. Concerning his argument that the commonsensical intuitions are overcome in modern physics, the commonsensical intuitions can be seen as 'epistemological obstacles', and modern physics is regarded to break them. Similarly, his rejection of the universal frame of reference for time and the absolute observer can be seen as a criticism of empiricism. Instead of classical physics, he argues that modern physics further transcendences the universal and absolute frame of reference by including time variation for different observers, as mentioned. Instead of a universal and absolute frame of reference, he argues that

special relativity deals with the non-existence of a universal observer for time. Similarly, quantum mechanics put observation at the center of the debate by not taking it for granted. In other words, physical phenomena lose its absolute and universal reality not only in terms of different frames of reference but according to every observational act. Thus, Beiser narrates that classical physics creates some problems (which can be read as 'epistemological obstacles' from the lens of Bachelard and Althusser) and modern physics constitutes a break from these problems (obstacles). However, I argue that a continuity of similar 'epistemological obstacles' exists between modern physics and classical physics in Beiser's narration. Then, I show the employment of a similar Cartesian dichotomy between the given subject and the given object in modern physics according to Beiser's narration. In other words, I argue that modern physics is likewise committed to the notion of universal observer and related universal knowledge. Nevertheless, I also argue that there exists an extension in the multiplication of frames of references (observations) and analytical categories (physical phenomena). I show this multiplication in the increasing focus on the particular explanation for particular physical phenomena instead of general theories.

### 3.2. Different Frames of References, Relativity, and the Speed of Light

Beiser's textbook differentiates the theory of relativity from classical physics by emphasizing the notion of a frame of reference. According to the textbook, this notion leads to the collapse of universal and absolute concepts. In Beiser's narration, classical physics also contains this notion of the frame of reference in respect of space. The frame of reference is contained in the theory of relativity in classical physics and it contradicts our commonsensical intuitions in everyday life. However, classical physics lacks the theory of relativity in respect of time. Thus, the concept of time appears as absolute and universal in classical physics according to Beiser. Conversely, special relativity overcomes the absolute and universal conceptualization of time by having the theory of relativity of time. In the textbook, special relativity, thus, overcome the obstacles rooted in the scientific common sense of the case of classical physics. Although Beiser narrates that special relativity overcomes the

obstacles rooted in classical physics, I argue that similar 'epistemological obstacles' are still there.

### 3.2.1. Frames of References contra Universality and Absoluteness of Time

Beiser (2003, p. 3) opens up the theory of relativity by stating the dependence of physical phenomena on a particular frame of reference. He exemplifies this with the difference of motion for different observers (p. 5). For example, if the observer and the observed object are moving toward each other, the speed of the observed object becomes slower in comparison to the observation of a stationary observer. However, this also applies to the phenomenon of time in the case of special relativity unlike classical physics (p. 5). According to Beiser (p. 5), if we assume that duration is measured by the movement of a particular object, it is also applied to time. "A moving clock ticks more slowly than a clock at rest" (p. 5). The clock can be understood as the tool by which we measure (or observe) time. The condition of an observational tool (clock's movement) affects the outcomes of observation. He further illustrates this point with the popular twin paradox in which a twin (Dick) is sent to space by an aircraft while another twin (Jane) waits in the world (p. 18). In this situation, the twin who went to space gets older than the one in the world because the flow of time changes according to the condition of the observer (p. 18). Beiser (p. 18) argues that there exists a paradox because both Dick and Jane see each other as moving. He narrates the paradox as follows: From Jane's perspective, Dick is moving away but it also applies to Dick since Dick also sees the Eart as moving away (p. 18). Thus, they must both experience an equal aging process (p. 18). However, Dick is getting older than Jane. According to Beiser, the reason is that

> *Dick changed from one inertial frame to a different one when he started out, when he reversed direction to head home, and when he landed on the earth. Jane, however, remained in the same inertial frame during Dick's whole voyage. The time dilation formula applies to Jane's observations of Dick, but not to Dick's observations of her. (p. 18)*

In other words, Beiser narrates that, from the frame of references of both Dick and Jane, they both see each other as moving away. Nevertheless, when the aircraft of Dick has changed its direction back to the Earth, then it is resolved that the one

moving away is not Jane but Dick. In Beiser's narration, it leads to the conclusion that the differences in frames of reference (the shift of the frame of reference when Dick turns back) lead to the differences in the flow of time. While Jane is always in the same frame of reference (the Earth), the frame of reference to which Dick belongs changes when the spacecraft changes its direction back to the Earth. Here, one can see that the shift of the frame of reference constitutes the major reason behind the collapse of absoluteness and universality of time in special relativity in Beiser's narration.

If we locate this in the theoretical framework provided by Althusser and Bachelard, it can be more illuminatory. Beiser narrates the transformation of knowledge production as an 'epistemological break' because our common sensical notions (as 'epistemological obstacles' ) are attempted to be overcome in the special relativity. In this narration, the notion of a universal and absolute frame of reference constitutes an instance of Cartesian understanding of cogito. As mentioned, the Cartesian understanding poses the problem of knowledge as a mirror effect. According to Althusser, the observer must reflect the reality of the observed object (Althusser & Balibar, 1970, p. 19). By doing this, the observer sees the object *per se* as if the observer's vision is not shaped by an 'invisible terrain' (in Althusserian terms) (p. 19). Likewise, Beiser's criticism of classical physics brings forth the idea that observation is not absolute but always depends on a specific frame of reference or better-put a specific condition of the observer. In his understanding, as above-mentioned, the observed body does not have characteristics of its own (as in classical physics) but its characteristics are shaped by the observation (as in special relativity and quantum physics that I discuss later on).

### 3.2.2. Speed of Light as a Universal and Absolute Constant

Beiser aims to clarify the break between classical physics and modern physics. He argues that the predictions of classical physics appear to have correspondence with the common-sensical observation in contrast to modern physics. However, he argues that special relativity and classical physics have similar explanations for everyday phenomena (Beiser, 2003, p. 5). The reason is that special relativity gives the same

result as classical physics for physical phenomena which are much slower than the speed of light (p. 5). He states

> *As we will find, relativistic and Newtonian mechanics agree for relative speeds much lower than the speed of light, which is why Newtonian mechanics seemed correct for so long. At higher speeds Newtonian mechanics fails and must be replaced by the relativistic version.*

Therefore, the speed of light appears as the limit that distinguishes classical physics from modern one. However, Beiser (p. 2) argues that the speed of light is a constant that is universal. Indeed, many formulas he outlines within special relativity involve this constant. Throughout the chapter, he provides many formulas for explaining phenomena like time dilation (p. 7) to the constant expansion of the universe (p. 10). For instance, if a body is moving closer to the speed of light, then the time dilates for this body (p. 7). However, this is not the case when the body is moving much slower than the speed of light (p. 7) Thus, special relativity is grounded in this universal constant and this constant is what distinguishes classical physics from special relativity. Indeed, this very constant constitutes the main operating principle of special relativity on which everything is built on. He states "All motion is relative; the speed of light in free space is the same for all observers" (p. 1).

Nevertheless, Beiser (2003, p. 3) provides two major justifications for the existence of this constant. First of all, he asserts that it is verified by many experiments. However, these experiments are not the reason behind its postulation in Beiser's (p. 3) narration. In the textbook, experiments only verify the already postulated constant *post factum*. This postulation of mathematical formula out can be seen as the reproduction of similar 'epistemological obstacles'. Bachelard (1984, p. 5) defines scientific activity as an effective production that makes the rational real. In other words, he argues that scientific activity transforms the world by positing its rational concepts into reality (p. 5). Thus, scientific production is grounded on two different sets of metaphysical systems, one is rationalism and the other is realism in Bachelard's (p. 1) understanding. Nevertheless, in Beiser's narration of the speed of light as an absolute and universal constant in this argument, the rationalistic part is completely abandoned. Instead, in the textbook, the whole justificatory ground of scientific production finds its ground in its mere justification by experiments *post*

*factum*. As Beiser argues that positing universal characteristics of physical phenomena necessitates the existence of an absolute and universal frame of reference. Thus, the postulating of the speed of light as a universal constant necessitates the postulate of the universal frame of reference because the speed of light is the same for all frames of reference.

Beiser provides a second reason for the necessity of the speed of light as a universal constant. This argument is based on the basic intuitions of the human mind (Beiser, 2003, p. 8). He argues that if a spacecraft is moving at a greater speed than the speed of light, the observations of the one on Earth contradict the laws of physics (p. 8). He summarizes the argument as follows:

> *As I watch from the earth, the lamps in the spacecraft suddenly go out. You switch on a flashlight to find the fuse box at the front of the spacecraft and change the blown fuse (Fig. 1.6a). The lamps go on again. From the ground, though, I would see something quite different. To me, since your speed v is greater than c, the light from your flashlight illuminates the back of the spacecraft (Fig. 1.6b). I can only conclude that the laws of physics are different in your inertial frame from what they are in my inertial frame—which contradicts the principle of relativity. The only way to avoid this contradiction is to assume that nothing can move faster than the speed of light. (p. 8)*

In other words, he argues that if one goes faster than the speed of light, it leads to a contradictory observation for the observer on Earth. This contradiction is rooted in the assumption that the laws of physics cannot be different in other frames of reference. This principle is also postulated without any other justification as follows: "The laws of physics are the same in all inertial frames of reference." (p. 3). In this argument, Beiser brings forth basic intuitions as the justificatory ground behind scientific production. However, Beiser narrates the break between classical and modern physics by reference to the former's correspondence with our basic commonsensical intuitions. Thus, similar 'epistemological obstacles' are reproduced in this case, too.

Thus, if locate the textbook into the schema provided by Althusser and Bachelard, Beiser narrates that modern physics overcomes 'epistemological obstacles' inherited by classical physics. This break is based on the fact that modern physics rejects the existence of a universal and absolute frame of reference. However, the organizing

principle of special relativity is based on the status of the speed of light as a universal constant. For justifying this constant, Beiser appeals to the notion of a universal frame of reference and our basic intuitions. However, this leads to the reproduction of similar 'epistemological obstacles' because the main tenets of breaking from these obstacles are narrated by him as the collapse of the universal frame of reference and the rejection of common-sensical intuitions. This narration of break and corresponding relapse into the existing obstacles of classical physics is furthered in his narration of quantum mechanics.

### 3.3. Wave-Particle Duality and Planck Constant

Beiser open up quantum mechanics by discussing the wave-particle duality. He argues that both our commonsensical intuitions and classical physics treat waves and particles as absolutely different physical phenomena (Beiser, 2003, p. 53). In his narration, while special relativity overcomes the narration of absolute frame of reference, Beiser further argues, here, that absolute distinctions between physical phenomena are collapsed in quantum physics. Beiser (p. 53). argues that, in the classical mechanics of Maxwell, light is conceptualized as waves. Wave theory of light, here, explains two major phenomena in his narration: First of all, two lights (or waves) can interfere and produce a new light wave. Secondly, it explains the notion of diffraction because it is the situation that the light is diffracted when it travels through a slit (p. 54). However, there exist other physical phenomena that the wave theory of light cannot explain. Beiser relates this inability explain to the absolutely assumed dichotomy between waves and particles. In contrast to such an attitude, quantum mechanics goes beyond such absolute dichotomies.

#### 3.3.1. The Collapse of the Absolute Duality between Waves and Particles: The Notion of Quanta

Beiser (2003, p. 54) argues that the wave theory of light is successful in the explanation of interference and diffraction because these two are built upon the wave-like behavior of light. The light, like waves, can interfere with each other and they can also be diffracted (p. 54). However, this theory does not explain another

phenomenon called the blackbody radiation. He provides a graph for explaining where the classical theory of light that treat it as a wave fails:

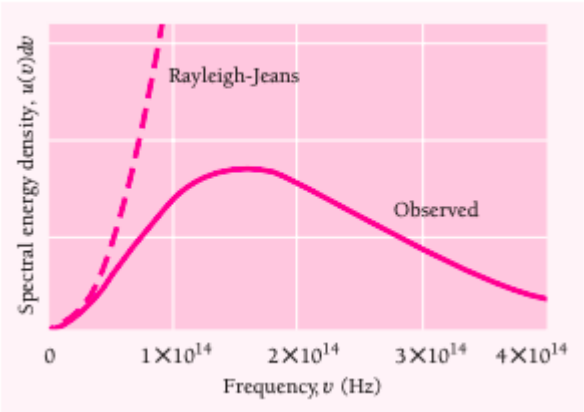



**Figure 1.** Emission of radiation in light rays. (Beiser, 2003, p.60)

This graph depicts the emission of radiation in light rays (p. 58). In this graph, Rayleigh-Jeans (as successors of Maxwell) refers to the classical theory of light that treat it as a wave. However, after a point, the observed measurement contradicts what the theory predicts (p. 59).[10] This discrepancy between the observed and the expected values leads to the emergence of the quantum theory of light (p. 61). As is shown in the graph, the observed value turns out to be diminished after some point. In Beiser's (p. 61) narration, the Planck constant accounts for the change of the curve's slope.[11] Beiser argues that the Planck constant account for the spread of light in discrete numbers of energies instead of its increase in a continuous manner (p. 61). Beiser states: "Each discrete bundle of energy *hv* is called a **quantum** (plural **quanta**) from the Latin for 'how much.'" (p. 61) However, this conclusion contradicts the wave theory of light according to Beiser (p. 67) because spreading in small packages does not fit into the wave behavior. These particles are called light packages in Beiser's narration (p. 64).

[10] A more complicated version of this narration is as follows: there exists a relationship between the temperature of the body and the emission of light rays, the latter increases with the increase of the former (p. 58). Beiser explains it as follows: "The spectral distribution of energy in the radiation depends only on the temperature of the body. The higher the temperature, the greater the amount of radiation and the higher the frequency at which the maximum emission occurs." (p. 58) However, Beaiser says that this increase has reversed after some point of the temperature increase (the point at which the object turned into ultraviolet) (p. 59).

[11] Because the constant leads to the change of slope after a constant point.

According to Beiser (2003, p. 67), the wave theory of light accounts for the mentioned phenomena of diffraction and interference because these fit into a wave-like behavior. Conversely, the particle theory accounts for the emission of electrons (namely photoelectrons) called the photoelectric effect (p. 62). Beiser (p. 64) suggests that similar to blackbody radiation, the photoelectric effect is related to the absorption of photons in small packages. According to Beiser (p. 64), when confronted with a metal, photons are absorbed and electrons are emitted. Nevertheless, "There must be a minimum energy $\Phi$ for an electron to escape from a particular metal surface" (p. 64). Thus, Beiser (pp. 62-63) argues that this behavior does not conform to Maxwell's theory of light as em waves (electromagnetic waves) which assumes continuity of absorption and emission. Instead of this wave behavior, photons are absorbed in discrete quantities like particles. To explain this contradictory situation, Beiser's narration includes many references to a break from commonsensical observations in the quantum theory of light. He claims that "The "true nature of light includes both wave and particle characters, even though there is nothing in everyday life to help us visualize that." (p. 68) Thus, Beiser argues that different observations can only be accounted for either by wave theory or particle theory since "As in the case of em waves, the wave and particle aspects of moving bodies can never be observed at the same time." (p. 67) As mentioned, while some effects (or observations of them) like diffraction and interference is explained by the wave theory of light, others like the photoelectric effect (or again the observation of it) can only be explained by the particle theory of light. Beiser argues that the joint explanation of the behavior of light by wave and particle theory leads us to interpretations based on quantum mechanics (p. 95). In Beiser's (p. 96) narration, this leads to a probabilistic explanation because light spreads like waves and it is a matter of probability to find how it spreads but photons (refer to both particle waves) can be observed in a specific place at a specific time. Therefore, he argues that "The certainties of classical mechanics are illusory" (p. 162).

### 3.3.2. Planck Constant as a New Absolute

From the point of view of Bachelard and Althusser, Beiser narrates an attempt to overcome the 'epistemological obstacles' of classical physics. This attempt is related

to the posited certainties and absolute dichotomies of classical physics. Nevertheless, similar 'epistemological obstacles' are reproduced in Beiser's text. Here, the notion of the Planck constant constitutes the major ground for this reproduction because this constant is constructed as the main organizing principle of quantum mechanics.

In Beiser's (2003, p. 138) narration, classical physics again appears as a special case of quantum mechanics (similar to the relationship between classical physics and special relativity). The expectations of classical physics correspond to the expectation of quantum mechanics until some point as shown in the previous graph. As in classical physics' explanation of common-sensical observations of light emission (in the previous graph) and the curve's slope change after some point, the Plack constant distinguishes classical and quantum physics. Planck constant is signified by *h* and it is used in nearly all formulas in the text, similar to the speed of light in the first chapter. It is used from the modes of photon emission (p. 75) to the electron orbits (p. 131). Thus, the Planck formula (like the speed of light) is postulated as a universal and absolute constant. I open up the function of the Planck constant in photon emission and electron orbits in the following two paragraphs.

Firstly, concerning different modes of photon emission, the postulation of the Planck constant leads to the emergence of various bodies in quantum mechanics in the depiction of Beiser. The main ground of all these various bodies is organized according to the absoluteness of the Planck constant. Beiser provides a graph for illustrating the photon interactions:

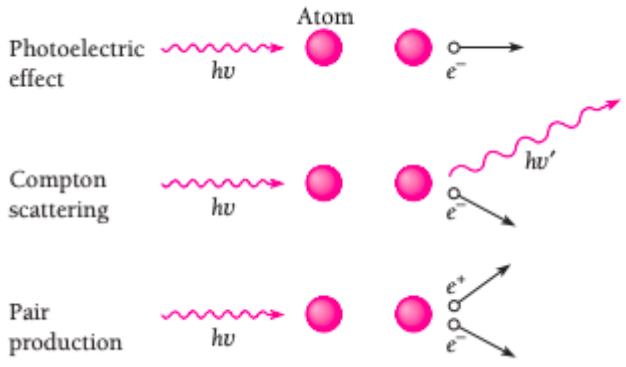



**Figure 2.** Illustration showing different mechanisms for the transformation of photons into physical bodies. (Beiser, 2003, p.83)

In this graph, various mechanisms that describe the transformation of photons into physical bodies are described. Beiser (2003, p. 83) interprets this graph as follows: In the first effect, photons lead to the emission of an electron. In the second one, some electrons are emitted because of photons' absorptions (which resemble the behaviors of particles) and some photons continue as it is (which resembles the behavior of waves) (p. 83). In the last graph, a photon is materialized into an electron and positron[12] (p. 83). However, they do not transform into each other in a continuum due to the existence of the Planck constant in Beiser's narration. Beiser (p. 83) argues that the photoelectric effect becomes Compton scattering and later into pair production after certain points of energy levels. These energy levels are discretely distinguished from each other due to the operation of the Planck constant in his narration. In other words, after awesome absolute energy levels, the modes of photons interactions are completely transformed in Beiser's narration. This transformation is accounted for by the absoluteness of the Planck constant in the textbook.

Secondly, concerning electron orbits, another function of the Planck constant can be seen in the Bohr atom model as the ground of quantum interpretation of atomic behavior according to Beiser. In defining electron orbits, Beiser states that,

> *when an electron in an excited state drops to a lower state, the lost energy is emitted as a single photon of light. According to our model, electrons cannot exist in an atom except in certain specific energy levels. The jump of an electron from one level to another, with the difference in energy between the levels being given off all at once in a photon rather than in some more gradual manner, fits in well with this model. (2003, p. 135)*

In other words, Beiser argues that orbits do not constitute a continuum but they are discrete. He claims that atoms jump from one orbit to another. However, orbits, as discrete energy levels, are simply there to the extent that these energy levels are absolute and universal for atoms (p. 136). Different atoms have different orbits but the level of orbits for each different atom is invariant and absolute. These energy levels of different atoms are determined by the possible energies an electron can

[12] Electron like particle but positively charged.

possibly lose and earn in Beiser's depiction (p. 136). According to him, these energy levels are determined by the behavior of photons that is determined by the Planck constant (p. 136). Since electron loses energy by emitting photons, they can only lose discrete energies. In the textbooks, energy levels of photons are absolute and determined by the Planck constant. Similarly, they can gain energy by absorbing photons but again in a discrete manner due to the same effect of the Planck constant on photons. As mentioned above, the Planck constant constant accounts for the particle-like behavior of light.

### 3.3.3. Reproduction of Epistemological Obstacles in the Case of Planck Constant, Particularistic, and Multiplied Concepts

From an Althusserin and Bachelardian point of view, the 'epistemological obstacles' of the previous paradigm are reproduced in Beiser's narration. The Planck constant constitutes the basis of all quantum mechanics as a universal and absolute certainty. From materialization of photon's energy to the behavior of sub-atomic particles is described by this constant. Similarly, certain orbits are treated as simply there universally and absolutely according to the atomic number and the Planck constant is the main explanation behind these energy levels. Thus, I argue that Beiser's narration of modern physics does not depart from the earlier certainties and universities of classical physics. On the contrary, this narration employs a similar universal and absolute perspective of analyses.

However, I also argue that effects (like the photoelectric effect, Compton effect, and pair production) and the produced bodies (like electrons, positrons, and photons) multiply. Also, it leads to the quantization of an atom's orbits. In Beiser's, description, while it was like a continuum in the classical theory, they are quantized, thus, multiply in the quantum theory. Although the textbook narrates an 'epistemological break' from the 'epistemological obstacles' of the earlier analyses, the contemporary paradigms as narrated by Beiser employ similar terms to the previous ones. However, analytical categories multiply in the textbook's narrations.

### 3.4. Uncertainty Principle and Schrödinger Equation

Beiser argues that

> *The fundamental difference between classical (or Newtonian) mechanics and quantum mechanics lies in what they describe. In classical mechanics, the future history of a particle is completely determined by its initial position and momentum together with the forces that act upon it. In the everyday world these quantities can all be determined well enough for the predictions of Newtonian mechanics to agree with what we find. Quantum mechanics also arrives at relationships between observable quantities, but the uncertainty principle suggests that the nature of an observable quantity is different in the atomic realm. (2003, p. 161)*

As claimed in the quotation, classical physics posits a universal observer for finding several equations that determine the characteristics of bodies in the empirical world as mentioned. Quantum physics, on the contrary, is based on observations that are uncertain. By introducing the notion of uncertainty, Beiser argues that absolute and universal concepts of classical physics are further overcome by quantum mechanics. He argues that uncertainty in quantum mechanics contradicts the common-sensical intuitions of classical physics (p. 127). In this understanding, physical phenomena do not have inherent properties in an absolute sense but the act of observation affects the whatness of the phenomena. In other words, every act of observation determines the characteristics of physical reality. Thus, it can be argued that Beiser's narration of quantum mechanics overcomes the 'epistemological obstacles' posed by classical physics and commonsensical intuition.

However, Beiser also argues that uncertainty is not only related to the act of observation but physical bodies *per se* are uncertain, too. That is to say, uncertainty is not only dependent upon the observation but they are inherently uncertain (or indeterminate). However, he argues that it is possible to produce scientific truths by assuming that this inherent uncertainty is determined by absolute and universal equations and constants. I argue that similar 'epistemological obstacles' are reproduced in the textbook around absolute and universal equations like the Schrödinger equation. This equation as previously mentioned constants are postulated as absolute and universal and it is assumed to determine the characteristics

of the physical reality. Nevertheless, I also argue that analytical concepts employed in the description of the phenomena multiply and become more particularistic.

### 3.4.1. Uncertainty Principle: The Effect of Observation

Beiser's narration of the uncertainty principle is based on the impossibility of positing deterministic frameworks. He claims that the uncertainty principle is based on the measurement process because it is not possible to know the characteristics of the observed without the process of observation in Beiser's description. However, the observation itself may affect the observed body (Beiser, 2003, p. 113). He argues that the observatory tool sends light to measure the momentum and position of electrons (p. 114). In Beiser's narration, this leads to the conclusion that "An electron cannot be observed without changing its momentum" (p. 113) because the sent photon affects either the momentum or position of the electron (e.g., they can be emitted by the electron and the electron change its orbit). In Beiser's depiction, the uncertainty principle is based on the measurement process. Beiser (p. 108) argues that the uncertainty of the future (the wave-like behavior of light) is rooted in the uncertainty of now. The principle is summarized as follows: It is not possible to know both the momentum[13] of a particle and its position (p. 108). To further illustrate this point, Beiser claims that the moment now differentiates the particle and wave theories of light (p. 96). He quotes W. L. Bragg as follows: "Everything in the future is a wave, everything in the past is a particle." (as cited in Beiser, p. 96). In Beiser's (p. 96) depiction, the moment now refers to the event of observation. The event of observation fixes the whatness of an electron as a particle at a specific point at a specific time (p. 96). Thus, Beiser argues that observation is at the center of quantum mechanics and observation transforms the phenomena.

Beiser's narration is in line with Bachelard's understanding of modern science. Bachelard (1984, p. 139) argues that objects do not exist prior to the observation in quantum mechanics. He argues that scientific activity is based on the realization of the rationalistic ideals of scientists (p. 13). According to Bachelard (p. 138) Apart

[13] Momentum is defined by Beiser as a combination magnitude of a particle and its direction of movement.

from observation, it is not possible to posit a dichotomy between object and motion in modern physics (p. 138). Furthermore, Beiser's narration on the difference between modern and classical physics is also in line with Karen Barrad's understanding of modern physics. Barad (p. 6) argues that modern physics is based on counterintuitive against the modernist assumptions of classical physics. She insists that quantum mechanics overcome the dichotomy between the observer subject and the observed object (Barad, 2007, p. 30). She grounds this argument on the basis of Bohr's account (p. 31). According to her, Bohr argues that the observations have performative effects and they determine the nature of things (p. 31). In her understanding, quantum mechanics does not represent an independent reality but instead, it transforms the very reality itself (p. 37). In both Bachelard's and Barad's understanding, modern physics overcomes the 'epistemological obstacles' inherited from classical physics. Thus, modern physics challenge common-sensical empiricism in this framework. Althusser describes empiricism as the dichotomy between the event itself and the observation of it, as previously mentioned (Althusser & Balibar, 1970, p. 40). Bachelard (1968, p. 46) likewise relates empiricism with the commonsensical assumptions regarding this same dichotomy between the phenomena and its conceptualization. Althusser, Bachelard, and Barad depict science's relations with the world as one of transformation and appropriation. However, I argue that, in Beiser's depiction, there exists the same dichotomy between the event itself and its observation. I also argue that there exists a multiplication of analytical categories and the increasing particularistic nature of these categories. I demonstrate these arguments in the following paragraphs.

### 3.4.2. Inherent Indeterminacy of Physical Bodies

Beiser (2003, p. 114) argues that the above-mentioned characterization of the uncertainty principle is not sufficient because this understanding reduces quantum uncertainty to the measurement process alone. He states that

> *Arguments like the preceding one, although superficially attractive, must be approached with caution. The argument above implies that the electron can possess a definite position and momentum at any instant and that it is the measurement process that introduces the indeterminacy in $\Delta x$ $\Delta p$. On the contrary, this indeterminacy is inherent in the nature of a moving body. The justification for the*

> *many "derivations" of this kind is first, they show it is impossible to imagine a way around the uncertainty principle; and second, they present a view of the principle that can be appreciated in a more familiar context than that of wave groups.*

As shown in this quotation, Beiser claims that uncertainty is not merely related to observation but it is inherent in the nature of physical phenomena. He argues that the above-mentioned characterization of the uncertainty principle is based on Heisenberg's understanding (p. 111). However, Heisenberg, later, was persuaded by Bohr who argues that this uncertainty (indeterminacy in Bohr's terminology according to Beiser)[14] is inherent in the nature of physical reality in Beiser's (p. 111) depiction. According to this understanding, whether something is a wave or particle is always uncertain in itself and this uncertainty is external to the observation.

Beiser argues that the above-mentioned depiction of the uncertainty principle (based on the relationship between the observer and the observed) can only be possible due to the inherent uncertainty of physical bodies. He narrates this principle as follows: As mentioned above, light is composed of the interference of waves and the production of wave groups through their superimposition in Beiser's (2003, p. 108) narration. It is also stated that the characteristics of a wave group are different than its composing parts (p. 99). In other words, the multiplication of the probabilistic distribution of two waves is not equal to the probabilistic distribution of the wave group composed of these two waves. This superimposition leads the uncertainty in the following ways: If the wave group is wider, one can find momentum because wavelengths are more clear (p. 108). However, the position of the particle becomes more uncertain because the probability of finding it in a certain place increases with the wider wave group (p. 108). Conversely, if the wave groups are narrower, the probability of finding the particle is more precise but the momentum is not (p. 108). In this description, Beiser narrates the issue as that the uncertainty is sourced from the nature of light composed by the superimposition of wave groups.

The uncertainty in the measurement process is rooted in the nature of light. Beiser (2003, p. 113) depicts the origin of uncertainty as follows: if the wave group of *sent*

[14] While uncertainty refers to Heisenberg's understanding, Bohr employs the notion of indeterminacy for describing quantum mechanics as narrated in Beiser's textbook. I generally use the notion of uncertainty for describing the textbook's narration (other than direct quotations) of both of these understandings because Beiser relates these two accounts around the notion of uncertainty.

photons is wider, finding the position of the electron turns out to be uncertain but momentum is more precise. If the wave group of *sent* photons is narrower, finding momentum turns out to be uncertain but the position of electrons is more precise (p. 113). Thus, the observation renders the physical body uncertain only because the observation can only be possible with the sent of waves, and these waves are superimposed in Beiser's description. Thus, there still exists a dichotomy between the observation of the event and the event itself because the physical body is regarded as uncertain in itself.

### 3.4.3. Reproduction of Epistemological Obstacles in the Case of Schrödinger Equation, Particularistic, and Multiplied Concepts

However, the only characteristic of the physical body is not uncertainty instead, it is again governed by universal laws. Schrödinger equation is, now, postulated as a universal principle that governs the physical bodies. For instance, the Schrödinger equation governs the behavior of light as both wave and particle in the double-slit experiment in Beiser's understanding. Beiser's depiction of the double-slit experiment is as follows "When it passes through the slits, light is behaving as a wave does. When it strikes the screen, light is behaving as a particle does. Apparently, light travels as a wave but absorbs and gives off energy as a series of particles" (2003, p. 68). Physicists, however, can find the probability of the characteristics of particles' spread (p. 170). Finding this probability is depicted to be only possible by the employment of the Schrödinger equation because it gives the expected values of particles (p. 170). In other words, the Schrödinger equation is valid and this validity is merely derived from its conformity with the experiments *post factum*.

Beiser describes the Schrödinger equations as follows: "***A basic physical principle that cannot be derived from anything else***" (2003, p. 166). In Beiser's (p. 166) description, the Schrödinger equation cannot be deduced from other physical principles but it is an ultimate principle on its own. Then, he argues that the Schrödinger equation

> *is really a wild leap with no formal justification; this is true for all other ways in which Schrödinger's equation can be arrived at, including Schrödinger's own approach. What we must do is postulate Schrödinger's equation, solve it for a variety of physical situations, and compare the results of the calculations with the results of experiments. If both sets of results agree, the postulate embodied in Schrödinger's equation is valid. If they disagree, the postulate must be discarded and some other approach would then have to be explored. (p. 168).*

In this quotation, the only justification of the Schrödinger equation is derived from its consistency with the measurement. In other words, the Schrödinger equation is confirmed by the repetition of several observations. From the perspective of Bachelard, like in the case of the Planck constant, it is not possible to find both accounts of realism and rationalism as the two major metaphysical systems of scientific activity. Instead, the rationalistic system is completely subjugated to the realist aspect of scientific production. According to Beiser, the Scrrödinger equation is posited as a universally valid principle that holds everywhere and it is postulated *post factum*.

If we approach this issue from the lenses of Althusser and Bachelard, this narration only constitutes the continuation of the similar 'epistemological obstacles' of classical physics. Beiser insists on the break from the 'epistemological obstacles' of classical physics by referring to the absence of universal observation and deterministic analysis. He argues that modern physics overcomes our common sensical observations about the world. However, he narrates that the only possibility to understand the behavior of sub-atomic particles is the postulation of a universal equation (Schrödinger equation this time) based on the repetition of observations. Beiser posits a universally valid principle that explains everything.

In Beiser's narration, it is possible to see the difference between the observation of the event and the event itself. He puts a distinction between the event itself and its observation by stating that

> *There is a big difference between the probability of an event and the event itself. Although we can speak of the wave function Ψ that describes a particle as being spread out in space, this does not mean that the particle itself is thus spread out. When an experiment is performed to detect electrons, for instance, a whole electron is either found at a certain time and place or it is not; there is no such thing as a 20*

> *percent of an electron. However, it is entirely possible for there to be a 20 percent chance that the electron be found at that time and place. (2003, p. 96)*

As shown in this quotation, there exists a clear differentiation between the observation and the event itself. From the perspective of Bachelard and Althusser, I argue that Beiser's description of quantum mechanics relapses into the existing paradigm of classical physics. Beiser constructs the dichotomy between classical and quantum physics on the basis of uncertainty rooted in observation. However, he also argues that the posited uncertainty is not the property of observation instead it is the property of the thing out there independent of physics's theoretical framework. Also, this external object is narrated as not only uncertain but it is also governed by universal laws like the Schrdöginder equation. Thus, the Shcrödinger equation provides the possible behaviors of physical bodies.

However, I also argue that there exists a multiplication of observations and analytical tools in Beiser's narration. Schrödinger equation is not deterministic but instead probabilistic. As seen in the quotation, this equation frames the probabilistic spread of electrons. This probabilistic understanding leads to the rising significance of particular cases because the probabilistic distribution is modified according to every other physical body. Beiser (2003, p. 168) asserts that the Schrödinger equation is related to the forces acting on physical phenomena (such as an electric field of an atomic nucleus). Thus, the Schrödinger equation includes variables related to the position of the particle (p. 168). However, these variables (by definition) are various for every different particle. Thus, the equation does not posit a deterministic behavior of particles but its outcomes are always indeterminate and probabilistic. Explanations and formulas rely on the multiplication of analytical categories and they exhibit an increasingly particularistic nature. It can be seen in the adaptation of the formula to each particular situation in a probabilistic way and the formulas' various applications in different micro cosmoses.

### 3.5. Chapter Conclusion

In this chapter, I argue that the depiction of postulates of classical physics by Arthur Beiser is in line with the notion of 'epistemological obstacles'. These obstacles

include universal observer and absolute categories such as absolute motion. He narrates a break from these ‘epistemological obstacles’ in modern physics. Nevertheless, I argue that there exists the continuity of similar ‘epistemological obstacles’ in modern physics within Beiser’s narration. However, I also argue that the frames of reference (observation) and analytical categories (physical bodies) multiply and turn out to be more particularistic.

I substantiate my argument in three sections. In the first section, I show that Beiser narrates special relativity as an attempt to overcome the ‘epistemological obstacles’ of classical physics. However, I also show that special relativity, in Beiser’s understanding, is committed to similar absolute reference points as in the case of the speed of light as a universal constant. In the second section, I demonstrate the continuity of the same ‘epistemological obstacles’ within the case of wave-particle duality. Beiser argues that this duality contradicts the commonsensical assumptions and departs from the postulates of classical physics. Nevertheless, I argue that he posits the Planck constant as the main dividing line between classical and modern physics, and this constant is likewise framed as universal and absolute according to Beiser. Thus, the Planck constant turn out to be the organizing principle of quantum physics in the textbook. He grounds the universality of the Planck constant in two main points including its verification by observations and its conformity to the commonsensical intuitions. Therefore, he derives the universality of the Planck constant either from common sense or draws a correspondence between the observations (which are treated as universally valid) and the Planck constant. Thus, similar ‘epistemological obstacles’ are still there in his narration of modern physics. However, the physical phenomena (such as orbits of atoms) and physical effects (such as the Compton effect) multiply. In the third section, I discuss the uncertainty principle to show the pervasiveness of similar ‘epistemological obstacles’. Beiser narrates the uncertainty principle as the determining effect of observation on the observed bodies. I argue that although this narration seems to overcome the empiricist conceptualization of knowledge, e.g., the mirror myth, it, is, indeed reproduces similar ‘epistemological obstacles’. I show this in Beiser’s narration that the physical bodies have an inherent uncertainty (or indeterminacy) independent of the act of observation. In Beiser’s description, modern physics, again, device

universal equations for dealing with this inherent uncertainty. I exemplify the employment of universal equations in the case of the Schrödinger equation. I also argue with the multiplication of observations and analytic tools due to the probabilistic nature of the Schrödinger equation instead of the earlier deterministic analyses of classical physics.

To sum up, I argue that similar ‘epistemological obstacles’ are still there in Beiser’s textbook, and it is not possible to observe a break from the obstacles of classical physics. Instead, Beiser’s narration of modern physics reproduces similar ‘epistemological obstacles’. However, I also argue that there exists a multiplication of analytical categories and frames of reference. This multiplication leads to the increasing importance of particularistic research instead of deterministic and general theoretical frameworks.

# CHAPTER 4

# CONCLUSION

The purpose of this study is to investigate the canonization of scientific activity in textbooks in the field of modern physics and cultural studies. I analyze two textbooks including Arthur Beiser's textbook *Concepts of Modern Physics* and Longhurst et al.'s textbook *Introducing Cultural Studies*. These two textbooks narrate a transformation of scientific activity from common sense and scientific common sense crystalized in previous scientific studies. I analyze these two textbooks from the theoretical framework of Bachelard and Althusser around the concepts of 'epistemological obstacle' and 'epistemological break'. I argue that their narration can be analyzed as a narration of an 'epistemological break' of contemporary studies from the 'epistemological obstacles' of previous studies. Nevertheless, I argue that previous 'epistemological obstacles' are still there and the concepts they employ are still rooted in these 'epistemological obstacles'. However, I also argue that there exists a transformation that the scientific concepts employed by them to multiply and become more particularistic. I substantiate my arguments in two main chapters and three main sections for each chapter.

## 4.1. General Summary of Analysis

I organize the first chapter in three main sections which are organized in accordance with the definition of essentialism and reductionism provided by Longhurst et al. The first section focuses on the first criticism of Longhurst et al. against reductionism and essentialism, i.e., their criticism against differences within a single category that are left unexplained. This section discusses this point in the context of their criticism of the traditional critical theory, especially Marxism. Then, I show how Longhurst et al.'s textbook's narration of contemporary studies does not depart from the

‘epistemological obstacles’ of previous studies but only extends the existing obstacles. In other words, they still reduce cultural complexities into structural variables of class, gender, age, and race. However, the number of analytical concepts (cultural groups based on structural variables) in Longhurst et al.’s narration of contemporary studies multiply.

In the second section, I deepen the discussion of the ‘epistemological obstacles’ by focusing on Longhurst et al.’s second criticism of overgeneralization. This time Longhurst et al. criticize the previous studies due to their subsumption of cultural complexities in micro-level localities in four structural variables. However, I argue that it is possible to find continuity of the same mode of analysis in their narration of the contemporary scientific activity because the contemporary studies, as narrated by Longhurst et al., still ground cultural complexities in micro-level localities in the four structural variables. However, I argue that there exist two major transformations: Firstly, various constellations of structural variables in different particular micro-level settings. That is to say, four structural variables have multiplied intersections in various particular localities. Secondly, agents constantly compete within these structural schemas of inequality for increasing their share (gender, race, age, and class). However, agents are narrated in such a way that they cannot challenge structural categories *per se* but only change their position in the schema of structural inequalities in various contexts. This constant challenge leads to the employment of various constellations in every particular setting due to the constant transformation of constellations by agents. Thus, the employment of concepts (their different constellations and intersections) turns out to be particularistic and multiplied.

In the third section, I focus on Longhurst et al.’s third criticism of the perspectival nature of truth rooted in specific experiences of a group, geography, or time period. Then, I show how the contemporary studies as narrated by them apply the major structural variables to every setting regardless of cultural context and historical period. In this case, the structural variables are not only reproduced in various particular micro-level settings (as in the second section) but are also applied in every other cultural and historical context. However, it is again possible to find the mentioned two main transformations: firstly, a multiplied constellation of these

structural variables in different historical and cultural particular contexts, and secondly, agents' various positions within structural schemas of inequality according to particular settings. Thus, in all these three sections, my arguments can be summarized as follows: I show the continuity of similar ‘epistemological obstacles’ between Longhurst et al.’s narration of the previous and contemporary studies. However, I also show that the employment of concepts in contemporary studies, in the narration of Longhurst et al., multiplies and turns out to be more particularistic.

I organize the second chapter based on the definition of absoluteness and universality by Beiser’s textbook and their overcome in contemporary studies. In the first section, I focus on Beiser’s narration of special relativity as a break from the universal and absolute frame of reference concerning time in classical physics. In the narration of Beiser, special relativity goes beyond the conceptualization of time as a universal and absolute frame of reference by rendering the notion of time relativistic. Nevertheless, the organizing principle of the theory of special relativity, in Beiser’s narration, is the speed of light conceptualized as absolute and universal. Thus, I argue that there exist similar ‘epistemological obstacles’ in Beiser’s narration of the break between special relativity and classical physics. Nevertheless, I also argue that frames of reference concerning time (as analytical concepts) turn out to be multiplied and more particular according to various settings.

In the second section of the second chapter, I focus on Beiser’s narration of quantum mechanics as the overcome of the universal and absolute conceptualization of the duality between waves and particles. Beiser argues that the absolute and universal conceptualization of this duality is overcome in contemporary physics. Nevertheless, the organizing principle of quantum mechanics turns out to be the Planck constant conceptualized as absolute and universal in Beiser’s depiction. Thus, I argue that there exists the employment of concepts that are rooted in similar ‘epistemological obstacles’. However, I also argue that physical bodies and their interactions (as analytical concepts of physics) multiply and they turn out to be varied in particular settings.

In the last section of the second chapter, I focus on Beiser's narration of the uncertainty principle within quantum mechanics. In Beiser's depiction, contemporary studies overcome the distinction between the absolute status of the observer subject and the observed object. In this narration, the observation is conceptualized to determine the observed bodies. However, Beiser also argues that uncertainty is, in essence, not belong to the process of observation but physical bodies *per se* are indeterminate in quantum mechanics. Nevertheless, in Beiser's narration, quantum mechanics deal with this uncertainty by employing universal and absolute equations like the Schrödinger equation. Therefore, I argue that there exists a continuity of similar 'epistemological obstacles' but the analytical concepts (variables of equations) multiply and their constellations become sensitive to particular settings.

### 4.2. Scientific Activity and Neoliberalism

As I mentioned in the introductory section, various authors (Giroux, 2014; Marginson, 1993; Peat, 2007; Calvert, 2004; Tierney, 2001; Rüegg, 2011; Baker, 2008) characterize the transformation of higher education in the twentieth century by referring to the decreasing importance of pure and basic research and the increasing significance of 'applied research'. They also relate this transformation to the increasing integration of higher education and private enterprise.

I show that there exists a multiplication and particularization of analytical concepts that are rooted in the previous 'epistemological obstacles', instead of an 'epistemological break' in both Longhurst et al.'s and Beiser's textbooks. This process of multiplication and particularization can be seen as an outcome of the general transformation of higher education. As I mentioned before, many scholars mention the rising significance of 'applied research' in contrast to basic and pure research because of the university's integration with private enterprise (Peat, 2007; Calvert, 2004; Tierney, 2001). Calvert (p. 256) dichotomizes the general and 'applied research' by asserting that while the former explains a wider range of phenomena, the latter is only applicable to very few particular cases. 'Applied research' does not permit pure and rationalistic inquiry but supports empirically oriented research according to Peat (p. 923). For Tierney (p. 359), the rising significance of 'applied

research' is related to the increasing importance of particularistic and indeterministic explanations. Tierney (p. 362) claims that this situation does not allow the construction of unified and deterministic theories. According to Rüegg (2011, pp. 14-15), the ivory tower of academia has collapsed with the rising integration of the university into the market. Research turns out to be the main kernel of the academic activity in the analysis of Baker (2008, p. 37). From the perspective of these authors, the multiplication and particularization of analytical concepts can be fit into the general transformation of higher education in its further integration into the market processes.

In both Longhurst et al.'s and Beiser's textbooks, the current scientific activity is depicted to break from previous scientific theories. As mentioned in the body chapters, the underlying logic behind the analytical concepts of the current theories in the depiction of textbooks is still organized by the previous 'epistemological obstacles'. However, these analytical concepts multiply and become particularistic. This multiplication and particularization can be seen as an epitome of the transformation brought about by the neo-liberalization of higher education, and the corresponding neo-liberalization of knowledge production

## REFERENCES


Althusser, L. (2005). For Marx. (B. Brewster, Trans.). Verso.

Althusser, L. (1999). Machiavelli and Us. (G. Elliott, Trans.). Verso.

Althusser, L., & Balibar, E. (1970). Reading Capital. (B. Brewster, Trans.). NLB.

Apple, M. W. (2000). Cultural Politics and the Text. In M. W. Apple (Ed.), Official Knowledge (2nd ed., pp. 179–195). essay, Routledge.

Bachelard, G. (2002). The Formation of the Scientific Mind: A Contribution to a Psychoanalysis of Objective Knowledge. (M. M. Jones, Trans.). Clinamen Press.

Bachelard, G. (1984). The New Scientific Spirit. (A. Goldhammer, Trans.). Beacon Press.

Bachelard, G. (1968). The Philosophy of No: A Philosophy of the Scientific Mind. (G. C. Waterston, Trans.). The Orion Press.

Barrett, M. (1991). Politics of Truth. Polity Press.

Beiser, A. (2003). Concepts of Modern Physics (6th ed.). McGraw-Hill.

Baker, D. P. (2008). Privatization, Mass Higher Education, and the Super Research University. Symbiotic or Zero-Sum Trends. Die Hochshule: Journal Für Wissenchaft Und Bildung, 17(2), 36–52.

Barad, K. (2007). Meeting the Universe Halfway. Duke University Press.

Berger, P., & Luckmann, T. (1991). The Social Construction of Reality: A Treatise in the Sociology of Knowledge. Penguin.

Bloor, D. (1981). The Strengths of the Strong Programme. Philosophy of the Social Sciences, 11(2), 199–213. https://doi.org/10.1177/004839318101100206

Buchbinder, H. (1993). The Market Oriented University and The Changing Role of Knowledge. Higher Education, 26, 331–347.

Calvert, J. (2004). The Idea of "Basic Research" in Language and Practice. Minerva, 42(3), 251–268.

Cusset, F. (2003). French Theory: How Foucault, Derrida, Deleuze, & Co. Transformed the Intellectual Life of the United States. (J. Fort, Trans.). University of Minnesota Press.

David Peat, F. (2007). From certainty to uncertainty: Thought, theory and action in a postmodern world. Futures, 39(8), 920–929. https://doi.org/10.1016/j.futures.2007.03.007

Duhem, P. (1954). The Aims and Structure of Physical Theory. (P. P. Wiener, Trans.). Princeton University Press.

Durkheim, E. (1995). The Elementary Forms of Religious Life. (K. E. Fields, Trans.). The Free Press.

Eagleton, T. (1991). Ideology: An Introduction. Verso.

Elliott, A. (2022). Contemporary Social Theory: An Introduction (3rd ed.). Routledge.

Fleck, L. (1979). Genesis and Development of a Scientific Fact. (F. Bradley & T. J. Trenn, Trans., T. J. Trenn & R. K. Merton, Eds.). The University of Chicago Press.

French, A. P., & Taylor, E. F. (1978). An Introduction to Quantum Physics. Norton & Company.

Gerring, J., & Cojocaru, L. (2016). Selecting Cases for Intensive Analysis: A Diversity of Goals and Methods. Sociological Methods & Research, 45(3), 392–423. https://doi.org/https://doi.org/10.1177/004912411663169

Giddens, A., Duneier, M., Appelbaum, R. P., & Carr, D. (2018). Introduction to Sociology (11th ed.). Norton & Company.

Giroux, H. A. (2014). Neoliberalism's War on Higher Education (2nd ed.). Haymarket Books.

Heidegger, M. (1977). The Question Concerning Technology and Other Essays. (W. Lovitt, Trans.). Garland Publishing.

Jensen, S. J. (2012). The Ruling Ideas in the Textbook. In H. Hickman & B. J. Porfilio (Eds.), Ross, E. W. (2012). Foreword. In H. Hickman & B. J. Porfilio (Eds.), The New Politics of Textbook: Problematizing the Portrayal of Marginalized Groups in Textbooks (pp. ix–xi). essay, Sense Publishers. (pp. 41–64). essay, Sense Publishers.

Kuhn, T. S. (1996). The Structure of Scientific Revolutions (3rd ed.). The University of Chicago Press.

Knorr-Cetina, K. D. (1983). New Developments in Science Studies: The ethnographic challenge. Canadian Journal of Sociology / Cahiers Canadiens de Sociologie, 8(2), 153. https://doi.org/10.2307/3340124

Latour, B., Woolgar, S., & Salk, J. (2006). Laboratory life: The construction of scientific facts. Princeton University Press.

Lefebvre, H. (1991). The Production of Space. Blackwell.

Longhurst, B., Smith, G., Bagnall, G., Crawford, G., Ogborn, M., Baldwin, E., & McCracken, S. (2008). Introducing Cultural Studies (2nd ed.). Pearson Longman.

Lynch, M., & Bogen, D. (1997). Sociology's Asociological "Core": An Examination of Textbook Sociology in Light of the Sociology of Scientific Knowledge. American Sociological Review, 481–493.

Lyotard, J.-F. (1984). The Postmodern Condition: A Report on Knowledge. University of Minnesota Press.

Mannheim, K. (1954). Ideology and Utopia: An Introduction to the Sociology of Knowledge. Routledge.

Margison, S. (1993). Education and Public Policy in Australia. Cambridge University Press.

Marx, K. (1978a). Capital, Volume One. In R. C. Tucker (Ed.), The Marx - Engels Reader (pp. 294–442). essay, Norton & Company.

Marx, K. (1978b). The Grundrisse. In R. C. Tucker (Ed.), The Marx - Engels Reader (pp. 221–293). essay, Norton & Company.

Marx, K. (1978c). Theses on Feuerbach. In R C Tucker (Ed.), The Marx - Engels Reader (pp. 143–145). essay, Norton & Company. .

Marx, K. (1978d). Wage Labour and Capital. In Robert C. Tucker (Ed.), The Marx-Engels Reader (2nd ed., pp. 203–217). essay, Norton & Company.

Marx, K., & Engels, F. (1978). Manifesto of the Communist Party. In Robert C Tucker (Ed.), The Marx - Engels Reader (pp. 469–500). essay, Norton & Company.

Mücen, B., Yıldırım, E., & Topal, Ç. (2016). Önsöz: Paylaşımlar: Üniversite/Bilgi/Üretim. In B. Mücen, E. Yıldırım, & Ç. Topal (Eds.), Paylaşımlar: Üniversite/Bilgi/Üretim (pp. 9–24). essay, İletişim.

Niiniluoto, I. (2019, October 16). Scientific progress. Stanford Encyclopedia of Philosophy. https://plato.stanford.edu/entries/scientific-progress/#ReaIns

Oppenheim, P., & Kemeny, J. G. (1956). On Reduction. Philosophical Studies, 7, 6–19.

Psillos, S. (2005). Scientific Realism: How Science Tracks Truth. Routledge.

Popper, K. (1963). Conjectures and Refutations: The Growth of Scientific Knowledge. Routledge.

Putnam, H. (2010). Meaning and the Moral Sciences. Routledge.

Ross, E. W. (2012). Foreword. In H. Hickman & B. J. Porfilio (Eds.), The New Politics of Textbook: Problematizing the Portrayal of Marginalized Groups in Textbooks (pp. ix–xi). essay, Sense Publishers.

Rüegg, W. (2011). Themes. In W. Rüegg (Ed.), History of the University in Europe (Vol. 4, pp. 3–30). essay, Cambridge University Press.

Sève, L. (2021). Where is Marx in the work and thought of Vygotsky? Mind, Culture, and Activity, 28(4), 293–303. https://doi.org/10.1080/10749039.2021.1964535

Zizek, S. (2000). The Ticklish Subject: The Absent Centre of Political Ontology. Verso.

# APPENDICES

## A. TURKISH SUMMARY / TÜRKÇE ÖZET

Genel sağduyu bilimsel dönüşümü bilimsel faaliyetin doğasında varolan bir ilerleme meselesi olarak ele alır. Benzer şekilde birçok filozof ve akademisyen, aynı ilerleme mefhumunu vurgulayarak bilimsel dönüşümü toplumsal yerleşikliğinden soyutlar. İster gerçekçi ister araçsalcı olsun bilim felsefesindeki hakim paradigmalar bu anlayışı takip ediyor görünmektedir. Tersine bu tez bilimsel üretimi toplumsal sürece gömülü bir faaliyet olarak ele almakta ve bu çerçevede bilimsel dönüşüm kavramını incelemeyi amaçlamaktadır.

Bilgi sosyolojisi, bilgi sürecini toplumsal bir süreç olarak inceleyen bağımsız bir dal olarak ortaya çıkmıştır. Bilgi sosyolojisi çalışmalarının tümü, hem genel olarak bilginin hem de özel olarak bilimsel bilginin sosyal ve tarihsel bir açıklamasını sunar. Bu tez de, bilgi sosyolojisi perspektifinden hareketle, bilimsel pratiğe toplumsal süreçlerden bağımsız değil, onların içinde gömülü olarak yaklaşmaktadır. Bu sebeple bilimsel dönüşüm ve ilerlemenin bilimsel sağduyuda nasıl işlediğini görmek için bilimsel ders kitaplarına odaklanılmıştır. Ders kitapları, bilimsel üretimin kanonlaştırılmış biçimlerini sunar ve soyut biçimindeki bilimsel etkinliğin aksine, sağduyudaki bilimsel dönüşüm ve ilerleme anlatımlarını incelemek için uygundur. Bu sebeple bu tez şu soru çevresinde kendini kurar: Bilimsel ders kitaplarında bilimsel dönüşüm anlatımı var mı, eğer varsa bu anlatım nasıl şekilleniyor? Bu soruya yoğunlaşmak için Arthur Beiser'in *Concepts of Modern Physics* kitabı ve Longhurst ve arkadaşlarının *Introducing Cultural Studies* ders kitapları seçilmiştir. Bu kitaplardan yola çıkarak iddia etmekteyim ki: Ders kitaplarında anlatıldığı şekliyle, yeni ve eski paradigmalarda analitik kavramların üzerine yükseldiği organize edici zeminde bir süreklilik görülmektedir. Ancak diğer yandan bu analitik kavramların çoğaldığını ve tikelleştirildiğini de gözlemlemek mümkündür. Burada

çoğalma derken kullanılan kavramların niceliksel olarak çoğalmasını ve tikelleşme derken kavramlar arası ilişkilerin her farklı bağlamda özel bir biçimde yeniden oluşturulmasını kastetmekteyim.

Bu tez Longhurst ve arkadaşları ile Beiser'in ders kitaplarını bilimsel dönüşümün sosyal gömülülüğü perspektifinden incelemektedir. Bu çalışma, bu ders kitaplarına ilgili alanlardaki pratisyenlerinin bakış açısıyla yaklaşmamakta veya onları sosyal bağlamlarından soyutlamamakta, bunun yerine onları sosyal olgular olarak görmektedir. Bu nedenle, bu ders kitaplarının iç çelişkilerini keşfetmeyi değil, bunun yerine bilgi üretim sürecini şekillendiren bilinçdışı unsurları bulmayı hedeflemekteyim. Bu çerçevede bu çalışma bahsi geçen ders kitaplarında anlatıldığı biçimiyle bilimsel dönüşüm ve ilerleme fikirlerine odaklanmaktadır zira bu kitaplar eski ve çağdaş teoriler arası bir gelişme ve kopuş anlatısı sunmaktadırlar. Bu anlatıyı incelemek amacıyla Bachelard ve Althusser tarafından sunulan metodolojik çerçeve önem kazanır zira bu iki teorisyen bilimsel dönüşümün epistemolojisi ve bilim ile sağduyusu arası ilişkinin niteliğine dair birçok katkı sunmaktadır. Bachelard, bilimsel dönüşümün genel dinamiklerini 'epistemolojik kırılma' ve 'epistemolojik engel' kavramları etrafında sunar. Althusser ayrıca, bu kavramları ideoloji kavramıyla ilişkili olarak toplumsal güçlere yerleştirerek bir okumasını sunmaktadır. Bir yandan epistemolojik engel kavramı, bilimsel faaliyetin dönüşümünü analiz etmek için gerekli araçları sağlar. Öte yandan ideoloji kavramı, bu dönüşümü toplumsal gerçekliğin genel dönüşümü içine yerleştirerek çözümlemek açısından önemlidir.

Bununla birlikte, hem Althusser hem de Bachelard kendi başına bilimsel üretim faaliyetine odaklanırlar. Başka bir deyişle, bu teorisyenler bilimsel üretimi tam anlamıyla sosyal bir olgu olarak ele almazlar, bunun yerine bilimsel üretimi kendinden menkul bir alan olarak incelerler. Bachlard bilimsel üretime yönelik epistemolojik bir yaklaşımı esas alır ve bilimsel üretimin kendiliğine odaklanır. Bachelard'a göre, epistemologlar kavramlar arasındaki ardışıklığa odaklanmalıdır. Bachelard bu silsileleri sözü edildiği gibi belirli dönemlerin ürünleri ve doğruluk rejimleri olarak görse dahi bilimsel dönüşümü epistemolojik açıdan, yani içsel organizasyonu bağlamında incelemektedir. Öte yandan Althusser, Bachelard'ın kavramlarının toplumsal gerçekliğe yerleşikliğini vurgulamakta ısrar etse dahi

bilimsel üretimi yine kendinden menkul bir alan olarak inceler zira Althusser bilgi üretiminin de kendine özgü bir üretim tarzına sahip olduğunu iddia etmektedir. Bachelard ve Althusser'in aksine bu tezin ders kitaplarına odaklanıyor oluşu, onlardan farklı bir kaygıyı barındırmaktadır çünkü bu tez temel itibariyle yüksek öğretimde bilgi üretiminin kanonlaştırılması ve kurumsallaştırılmasına odaklanmaktadır. Bu amaç için ders kitapları uygun bir araştırma objesi olarak görülebilir çünkü bu kitaplar aracılığıyla bilimsel üretim soyut bir faaliyet değil toplumsal sağduyu ile iç içe bir aktivite olarak ele alınabilir.

Bu çalışmanın ilk bölümünde Longhurst ve arkadaşlarının ders kitabına odaklandım. Bölümü Longhurst ve arkadaşları tarafından sağlanan özcülük ve indirgemecilik tanımına göre organize edilmiş üç ana alt başlık halinde düzenledim. Bu yazarlara göre özcülük ve indirgemecilik üç farklı karakter özelliğine sahiptir. İlk olarak özcüler ve indirgemeciler herhangi bir sosyal grubun içindeki farklılaşmaları açıklanmaktan imtina ederler. İkinci olarak özsel ve temel özellikler olarak ele aldıkları karakteristikleri aşırı genellemeler üzerine inşa ederler. Üçüncü olarak ise bu yaklaşımlar her ne kadar bakış açılarını nesnel ve evrensel niteliklere haiz gibi sunsalar da belirli bir grubun bakış açısına dayalıdırlar ve bu grubun çıkarlarına hizmet ederler. Longhurst ve arkadaşları bu karakteristikler çerçevesinde özcülük ve indirgemeciliği, kültürel çalışmaların aşması gereken engeller olarak görmektedir. Onlara göre, çağdaş haliyle kültürel çalışmalar özcülük ve indirgemecilik sorunlarının üstesinden gelmektedir. Longhurst ve arkadaşları açısından kültürel çalışmalar, kültürel karmaşıklığı birkaç yapısal faktöre indirgeyen açıklamaların ötesine geçmiştir. Bu tanımlar ve eleştiriler çerçevesinde bu bölümde iki temel argüman sunmaktayım: İlk olarak kökleri önceki epistemolojik engellerde bulunan kavramlar hâlâ oradadır ve kültürel karmaşıklık hâlâ birkaç yapısal faktöre indirgenmiştir. Ancak analitik kavramların iki ana yolla çoğaldığı ve tikelleştiği de ortaya çıkmaktadır. İlk olarak yapısal faktörler, farklı mikro düzeydeki çeşitli ortamlarda, farklı yerlerde ve farklı zaman dilimlerinde belirsiz bir şekilde üst üste binmekte ve ilişkilenmektedir. İkinci olarak faillerin yapısal faktörler içinde rekabet ettikleri, belirli ve istikrarlı bir konuma sahip olmadıkları varsayılmaktadır.

Bu bölümün ilk alt başlığında ders kitabının geleneksel teorilere eleştirileri, özellikle Marksizme yönelik eleştirileri, tartışılmaktadır. Kitaba göre, Marksistler her şeyi sınıf temelli bir eşitsizlik yapısı temelinde açıklamaktadır. Bu yaklaşım, kültürel karmaşıklığı basit sınıf konumlarına indirger ve kitaba göre modern teoriler bu tarz bir anlayışın ötesine geçmiştir. Marksizmin aksine ders kitabı kültürel karmaşıklığın önemini vurgular ve özellikle Weber'in katkılarının altını çizer. Zira Weber'in teorisinde sınıf kavramından farklı olarak kültürle iç içe ele alınabilecek statü grubu kavramı öne çıkar.

Longhurst ve arkadaşları statü gruplarının bir örneği olarak Hindistan'daki kastları ele alırlar. Ders kitabında bahsedildiği şekliyle kastlar geleneksel olarak Brahmanlar, Kşatriyalar, Vaisyalar ve Harijanlar gibi dört ana kategoride incelenmektedir. Bu dört ana kategori rahipler ve askerler gibi belirli mesleklerle ilişkilendirilir. Ancak ders kitabına göre bütün bir kast sistemini dört ana kategoriye indirgeyen bir tablo yanıltıcı olabilir zira kastlar arasında *jati* isimli farklı alt kast gruplarının olduğunu iddia ederler Dolayısıyla onlara göre bir farklılaşma söz konusudur. Ancak bu küçük grupları yine belirli mesleklerle ilişkilendirerek tanımlarlar.

Bachelard ve Althusser'in terminolojisine göre ders kitabındaki temel epistemolojik engel, yapı ve kültür arasındaki ikilemdir. Longhurst ve arkadaşlarına göre geleneksel teorilerde kültürel karmaşıklık yapısal faktörlere indirgenmiştir. Öte yandan ders kitabının kast anlatımlarında bu gruplar yine başka bir yapısal faktöre, yani mesleğe indirgenmiştir. Bununla birlikte, sosyal grupların sayısı (önce kastlar ve ardından jati grupları) çoğalmıştır.

Bu bölümün ikinci alt başlığında, Longhurst ve arkadaşlarının aşırı genellemeye yönelik ikinci eleştirisine odaklanılarak epistemolojik engeller tartışması derinleştirilmiştir. Bu kez ders kitabı, geleneksel teorileri bütün bir kültürel karmaşıklığı yaş, cinsiyet, sınıf ve ırk isimli dört temel yapısal değişkene indirgediği için eleştirmektedir. Longhurst ve arkadaşlarına göre kültürel çalışmalar, geleneksel açıklamaların üstesinden gelerek kültürel karmaşıklığın yapısal değişkenlere genellenmesinin önüne geçmiştir. Yerel ve mikro düzeylerde, kültürel karmaşıklığın yapısal değişkenlere genellenemez durumunu vurgularlar. Yapısalcı bir iktidar

kavramsallaştırmanın tersine, Foucaultcu iktidar anlayışına atıfta bulunurlar ve onu yerel bir iktidar anlayışı olarak kavramsallaştırırlar.

Bundan sonra, ders kitabı yerel iktidar kavramsallaştırmanın iki önemli avantajından bahsetmektedir. İlk olarak yerel düzeyde kavramsalaştırılmış bir iktidar anlayışı, yerel bağlamların tikelliklerini incelemeye olanak sağlar. Bunu göstermek için, cinsiyete veya yaşa göre farklılaşması sebebiyle sınıf pozisyonlarının kültürel açıklama için tek başına yeterli olmadığı birçok çalışmaya atıfta bulunurlar. Onlara göre, bu çalışmaların çıktıları sınıf kavramının yeterli olmadığını gösterir. Zira bu çalışmaların ele aldığı çeşitli yerel bağlamlarda sınıf kavramı diğer yapısal değişkenler olan cinsiyet, ırk ve yaş ile ya çelişmekte ya da üst üste binmektedir. İkinci olarak Longhurst ve arkadaşları yerel bir iktidar kavramsallaştırmasının, yapısal kategorilere failler tarafından meydan okunmasının zeminini hazırladığını iddia etmektedir. Bu meydan okuma hali yapısal kategorilerin tam ve kapalı olmasını engeller. Tasvirlerinde, failler gerçekten de belirli yapısal kategorilerle ilişkili bazı nitelikleri ve kaynakları değiş tokuş ederler, kaynaklarını arttırır veya azaltırlar. Örneğin, eril ya da üst sınıf niteliklere, dişil ya da alt sınıf failler tarafından el konulabilmektedir.

Bachelard ve Althusser'in analitik çerçevesinden bakıldığında temel epistemolojik engel, her şeyin yapısal değişkenlere genellenmesi ve indirgenmesidir. Bununla birlikte, yapısal değişkenler hala oradadır. İlk durumda bu değişkenlerin farklı kesişimleri (sınıf ve cinsiyetin kesişimi gibi) önem kazanmaktadır. İkinci durumda, yapısal değişkenler hala oradadır ancak bu yapılar içinde faillerin konumları değişmektedir. Böylece, epistemolojik engellerden kaynaklanan kavramlar hala oradadır, ancak bu kavramlar çoğalır ve tikelleşirler.

Üçüncü bölümde, Longhurst ve arkadaşlarının üçüncü eleştirisine odaklanılmaktadır. Bu eleştiride Longhurst ve arkadaşları gerçekliğin perspektivel bir doğası olduğunu vurgularlar. Onlara göre, gerçekliğin bu doğası spesifik bir grubun, coğrafyanın veya dönemin belirli deneyimlerine dayanmaktadır. Bu sefer yerellik kavramı, mikro düzeydeki bağlamaların karmaşıklığı ile değil, diğer kültürel coğrafyaların ve zaman

dilimlerinin karmaşıklığı ile ilgili olarak kurulmuştur. Kitap bunu kanıtlamak için çeşitli örneklere başvurmaktadır.

İlk örnekte, sosyal kategorilerin zaman ve mekana göre değiştiğini öne sürmektedirler. Örneğin, Batılı orta sınıf çocuklarının ailelerinin sahip olduğu kaynakların tek taraflı alıcısı rolüne sahip olduğunu, ancak farklı coğrafyalarda durumun böyle olmadığını öne sürerler. Bu coğrafyalarda çocuklar ve ebeveynler arasında karşılıklı bir kaynak akışı söz konusudur. İkinci örnekte sadece sosyal kategorilerin değil, maddi ürünlere atfedilen değerin de zaman ve mekana göre değişken ve hibrit durumunu vurgulamaktadırlar. Ürünlerin (örneğin İngiliz çayı veya ABD kolası) iki nedenden dolayı belirli bir kültürle ilişkilendirilemeyeceğini öne sürerler. İlk olarak, bu ürünlerin üretimi için farklı coğrafyalardaki maddi kaynaklar ve insan gücü kullanılmaktadır. İkincisi, bu ürünler her zaman melezleşir ve bu melezler aracılığıyla baskın tahayyüllere meydan okumak mümkündür. Mesela kitap *Mecca Cola*'yı ABD hakimiyetine karşı bir meydan okuma ve direniş biçimi olarak ele almaktadırlar.

Bachelard ve Althusser'in analitik çerçevesinden, bu tezin ana argümanlarının örneklerini bulmak yine mümkündür. İlk olarak tarihsel ve kültürel bağlamlarda bu yapısal değişkenlerin çoğalması ve tikelleşmiş bir kümelenmesi gözlemlenebilir. İkinci olarak faillerin meydan okumaları çerçevesinde yapısal eşitsizlik şemaları içindeki konumları sürekli dönüşmektedir. Bununla birlikte, benzer epistemolojik engeller hala mevcuttur zira ders kitabının anlatısı hala kendini temel yapısal değişkenler temelinde kurmaktadır.

Dolayısıyla, bu üç bölümün hepsinin de argümanları şu şekilde özetlenebilir: İlk olarak Longhurst ve arkadaşlarının anlatımında geleneksel ve çağdaş çalışmalarının arasındaki benzer 'epistemolojik engellerin' sürekliliği gösterilmektedir. Bununla birlikte, Longhurst ve arkadaşlarının anlatımındaki çağdaş araştırmalarda kavramların niceliksel olarak çoğaldığı ve tikelleştiği de gösterilmektedir.

Bu çalışmanın ikinci ana başlığında Besier'in *Concepts of Modern Physics* ders kitabına odaklanılmaktadır. Bu bölümü, Beiser'in ders kitabının mutlaklık ve

evrenselliğe yönelik eleştirilerinden ve bunların çağdaş araştırmalarda aşılışının anlatımından yola çıkarak düzenledim. Breiser, her yerde kullanılabilecek evrensel bir referans çerçevesinin ve mutlaklığın olmadığının altını çizmektedir. Beiser'e göre evrenselliğin ve mutlaklığın çağdaş fizikteki reddi fiziksel niteliklerin mutlak olarak kavramsallaştırıldığı günlük sağduyulu dünya görüşümüzle çelişir. Dolayısıyla mutlak ve evrensel nitelikler Beiser tarafından bilimin aşması gereken engeller olarak görülmektedir.

Birinci bölümde, Beiser'in klasik fizikteki zamana ilişkin evrensel ve mutlak referans çerçevesinden bir kopuş olarak özel göreliliği anlatışı üzerinde duruyorum. Beiser zaman mefhumunun, gözlemcinin ve gözlemlenenin hızına göre farklı gözlemciler için göreceli olduğunu savunur. Ama bir diğer yandan Beiser gündelik hayattaki fenomenler açısından özel göreliliğin ve kuantum fiziğinin benzer açıklamalara sahip olduğu konusunda da ısrarcıdır.  Bunun nedeni, özel göreliliğin, ışık hızından çok daha yavaş olan fiziksel olaylar için klasik fizikle aynı sonucu vermesidir. Örneğin, zaman yalnızca ışık hızına yaklaşıldığında genişler. Dolayısıyla ışık hızı sabiti, özel göreliliğin ana çalışma ilkesini oluşturur.

Bachelard ve Althusser'in analitik çerçevesinden bakıldığında temel epistemolojik engel, zamanın evrenselliği ve mutlaklığıdır. Ancak Beiser'in tasvirinde ışık hızı evrensel ve mutlak olarak tasvir edilmiştir ve zamanın göreliliğinin ana sebebini de ışık hızının mutlaklığı oluşturmaktadır.. Dolayısıyla epistemolojik engeller üzerine inşa edilen kavramlar hala mevcudiyetini korumaktadır ancak bu kavramlar aynı zamanda çoğalır. Zira farklı gözlemcilere göre farklı zaman kavramsallaştırmaları mümkün hale gelmektedir.

İkinci bölümde, dalgalar ve parçacıklar arasındaki ikiliğin evrensel ve mutlak kavramsallaştırmasının aşılması olarak Beiser'in kuantum mekaniği anlatımına odaklanıyorum. Beiser klasik mekanikte ışığın dalga olarak kavramsallaştırıldığını ileri sürer. Dalga teorisi Beiser'e göre iki temel fiziksel mefhumu açıklamaktadır. Her şeyden önce, iki ışık (veya dalga) iç içe geçebilir ve yeni bir ışık dalgası üretebilir. İkinci olarak ışık bir yarıktan geçerken aynı bir dalga gibi kırılmaktadır ve bu mefhum da aynı şekilde ancak dalga teorisi ile açıklanabilmektedir. Dolayısıyla

bu iki durumda ışık dalga gibi davranır. Bununla birlikte, dalga teorisinin açıklayamadığı ve sadece parçacık teorisi ile açıklanabilen fotoelektrik etki gibi başka fenomenler de mevcuttur.

Fotoelektrik etki, fotonların absorpsiyonu ile ortaya çıkan elektron emisyonu ile ilgilidir. Bununla birlikte, Planck sabitinden dolayı bu absorpsiyon ve emisyon süreçleri ancak belli minimum enerjilerde gerçekleşebilmektedir. Beiser buna benzer bir davranışın dalga teorisinin süreklilik varsayımı ile değil ancak parçacık yayılımının ayrıksallık varsayımı ile açıklanabileceğinin altını çizer. Bu dalga davranışı yerine, fotonlar parçacıklar gibi ayrık miktarlarda emilir. Farklı miktarlarda absorpsiyon ve emisyon, çeşitli fiziksel olaylara yol açar. Örneğin, foton absorpsiyonu belirli değerlerden sonra bir pozitron ve bir elektron oluşturabilir. Ya da mevcut elektronlar belirli değerlerin altında sadece saçılım yapabilir. Beiser'in anlattığı biçimiyle burada Planck sabiti belli minimum değerleri belirler ve süreklilikten ziyade ayrıksal değerleri takip edecek bir biçimde bu süreçler gelişir. Bu nedenle Beiser, ışığın hem dalga teorisinin hem de parçacık teorisinin doğru olduğunu çünkü bu iki teori arasında mutlak bir ikilik olmadığını savunuyor. Işık hem dalga hem de parçacık gibi davranır.

Bachelard ve Althusser'in bakış açısına göre, epistemolojik engeller, dalgalar ve parçacıklar arasındaki evrensel ve mutlak ikilemle ilişkilidir. Ancak Beiser'in anlatımında bu ikilik ancak yeni bir mutlakla, yani Planck sabitiyle aşılır. Bu sabit, evrensel ve mutlak olarak ele alınır ve kuantum fiziğinin açıklamalarının ana düzenleyici ilkesi olarak işler. Bu nedenle, analitik kavramlar hala epistemolojik engellerden üzerine inşa durumdadır, ancak bu kavramlar (çeşitli fiziksel fenomenler gibi) belirli durumlarda çoğalır ve tikelleşerek farklı bağlamlarda farklı nitelikler kazanır.

Son bölümde, Beiser'in kuantum mekaniği içindeki belirsizlik ilkesine ilişkin anlatımına odaklanıyorum. Beiser'in betimlemesinde çağdaş çalışmalar, gözlemci öznenin mutlak statüsü ile gözlemlenen nesne arasındaki ayrımın üstesinden gelmektedir. Bu anlatımda gözlem, gözlenen cisim üzerinde bir etki yaratır çünkü herhangi bir gözlem eylemi fotonların gözlenen nesne ile bir etkileşimini gerektirir.

Ancak fotonlar ile gerçekleşen bu etkileşim gözlenen cismin konumunu veya momentumunu etkilemektedir.

Bununla birlikte Beiser, belirsizliğin özünde gözlem sürecine ait olmadığını, kuantum mekaniğinde fiziksel varlıkların kendi başlarına da belirsiz olduğunu da savunur. Işık dalgalarının doğası, farklı durumlarda belirsizdir, çünkü aslında bunlar çeşitli dalgalardan oluşan dalga gruplarıdır. Ayrıca fotonlar belirli durumlarda dalgalar veya parçacıklar gibi davranabilirler. Bu bakımdan parçacıkların belirli konumlarını veya momentumlarını bulmak mümkün değildir, sadece olasılıksal dağılımlarını bulmak mümkündür. Beiser'e göre fizikçiler temelde olasılık dağılımlarını bulmaya odaklanırlar ve bunun için ana evrensel denklem olarak Schrödinger denklemini kullanırlar. Dolayısıyla Beiser'in anlatımında bu denklem fiziksel mefhumun açıklanmasındaki temel zemin haline gelmektedir.

Althusser ve Bachelard'ın bakış açısından epistemolojik engel, özne ile nesne arasındaki mutlak ve evrensel ikiliktir. Bununla birlikte, anlatıldığı biçimiyle belirsizlik aslında gözlemin salt etkisinde değil, fiziksel olguların temel doğasında yatmaktadır. Burada Schrödinger denklemi, fizikçilerin olasılık dağılımlarını bulmak için kullanabilecekleri mutlak ve evrensel referans olarak görünmektedir. Beiser, Schrödinger denkleminin hiçbir şeyden türetilemeyen temel bir fiziksel ilke olduğunu bile savunur. Bununla birlikte, bu denklem artık evrensel ve kesin sonuçlar vermemektedir, ancak sonuçlar her tikel durumda olasılıksaldır.

Her ne kadar Beiser çağdaş fiziği geleneksel fiziğin evrensellik ve mutlaklık varsayımlarının bir aşımı olarak görse de, çağdaş fiziği anlatırken kullandığı kavramlar benzer şekilde aynı epistemolojik engeller çerçevesinde kurulmuştur. Ancak bahsi geçen kavramlar giderek tikelleşir ve çoğalır.

Son bölümde, bu özelleşme ve çoğalmanın neoliberal birikim rejiminin sonucu olabileceğini öne sürüyorum. Yüksek öğretimin dönüşümüne ve bilgi üretimine odaklanan akademik yazın, neoliberalizmin üniversitelerin özelleştirilmesine yol açtığını öne sürmektedir. Bu yazına göre özelleştirme, uygulamalı araştırmanın ve araştırma üniversitesinin temel ve saf araştırmaya göre öneminin artmasına neden

olmuştur. Burada kavramların çoğalması ve tikelleşmesi bilgi üretimindeki bu dönüşümün bir sonucu olarak görülebilir zira uygulamalı araştırma temelindeki bir eğitim modeli evrensellikten ziyade tikel, özel ve çoğul olanı araştırmaya meyilli hale gelmektedir.

Özet olarak, hem Longhurst ve arkadaşlarının hem de Beiser'in ders kitaplarında, mevcut bilimsel faaliyetin önceki bilimsel teorilerden kopuşu ve ilerleyişi tasvir edilmektedir. Ana bölümlerde bahsedildiği gibi, ders kitaplarının tasvirinde mevcut teorilerin analitik kavramlarının altında yatan mantık, hâlâ önceki epistemolojik engeller tarafından organize edilmektedir. Ancak, bu analitik kavramlar çoğalır ve tikelleşir. Bu çoğalma ve tikelleşme, yükseköğretimin neo-liberalleşmesinin ve buna karşılık gelen bilgi üretiminin neo-liberalleşmesinin getirdiği dönüşümün bir sonucu olarak yorumlanabilir.

## B. THESIS PERMISSION FORM / TEZ İZİN FORMU

*(Please fill out this form on computer. Double click on the boxes to fill them)*

**ENSTİTÜ /** INSTITUTE

**Fen Bilimleri Enstitüsü** / Graduate School of Natural and Applied Sciences ☐

**Sosyal Bilimler Enstitüsü** / Graduate School of Social Sciences ☒

**Uygulamalı Matematik Enstitüsü** / Graduate School of Applied Mathematics ☐

**Enformatik Enstitüsü** / Graduate School of Informatics ☐

**Deniz Bilimleri Enstitüsü** / Graduate School of Marine Sciences ☐

**YAZARIN /** AUTHOR

**Soyadı** / Surname : Doğanay
**Adı** / Name : Yankı Doruk
**Bölümü** / Department : Sosyoloji / Sociology

**TEZİN ADI /** TITLE OF THE THESIS (**İngilizce** / English): The Problem of Epistemological Obstacle in Scientific Activity: Canonization in Higher Education Textbooks

**TEZİN TÜRÜ /** DEGREE**:** **Yüksek Lisans** / Master ☒ **Doktora** / PhD ☐

1. **Tezin tamamı dünya çapında erişime açılacaktır. /** Release the entire work immediately for access worldwide. ☒
2. **Tez iki yıl süreyle erişime kapalı olacaktır.** / Secure the entire work for patent and/or proprietary purposes for a period of **two years. *** ☐
3. **Tez altı ay süreyle erişime kapalı olacaktır.** / Secure the entire work for period of **six months**. ***** ☐

***** *Enstitü Yönetim Kurulu kararının basılı kopyası tezle birlikte kütüphaneye teslim edilecektir. / A copy of the decision of the Institute Administrative Committee will be delivered to the library together with the printed thesis.*

**Yazarın imzası** / Signature ..... **Tarih** / Date .....

*(Kütüphaneye teslim ettiğiniz tarih. Elle doldurulacaktır.)*
*(Library submission date. Please fill out by hand.)*

*Tezin son sayfasıdır. / This is the last page of the thesis/dissertation.*