



# A HISTORY OF BALANCE

## 1250–1375

The Emergence of a New Model of Equilibrium  
and its Impact on Thought

JOEL KAYE

CAMBRIDGE



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## A History of Balance, 1250–1375

The ideal of balance and its association with what is ordered, just, and healthful remained unchanged throughout the medieval period. The central place allotted to balance in the workings of nature and society also remained unchanged. What changed within the culture of scholasticism, between approximately 1280 and 1360, was the emergence of a greatly expanded sense of what balance is and can be. In this groundbreaking history of balance, Joel Kaye reveals that this new sense of balance and its potentialities became the basis of a new model of equilibrium, shaped and shared by the most acute and innovative thinkers of the period. Through a focus on four disciplines – scholastic economic thought, political thought, medical thought, and natural philosophy – Kaye’s book reveals that this new model of equilibrium opened up striking new vistas of imaginative and speculative possibility, making possible a profound rethinking of the world and its workings.

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and its Impact on Thought*

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Joel Kaye

*Barnard College, Columbia University*



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## Acknowledgments

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As important as my friends, family, and colleagues have been, I could never have completed a project of this size without the generous support of research institutions and funding agencies, along with the people who serve and direct them. My project began with a National Endowment for the Humanities (NEH) fellowship in 2000, during which I sketched a research plan for my project on the history of balance and began to look in the direction of medieval medicine. Holding, as I did, the vague notion that Galenic medicine was associated with “the balance of the humors,” I thought I would investigate further. At the end of this semester’s leave, after having spent six weeks as a visitor at the American Academy at Rome (at the invitation of its director, Lester Little) researching medical manuscripts at the Biblioteca Vaticana, I began to realize how vast and bountiful was the intellectual landscape I had wandered into. On the basis of this first foray into medicine, I applied for and was awarded a year-long National Science Foundation (NSF) book-project grant for 2001–2 to continue my studies of this subject. I spent much of the NSF year reading early printed editions of Galenic writings and their scholastic commentaries in the Rare Book Room of the New York Academy of Medicine, where I relied on the kind assistance of its librarians, Miriam Mandelbaum and Arlene Shaner.

To the extent that my teaching allowed, I continued my study of medicine until 2003–4, when I was admitted as a scholar in residence to the Institute for Advanced Studies, School of Historical Studies. That year I wrote the book’s first chapter (the current [Chapter 3](#)) on the legacy of Galenic balance and I made a start on the scholastic reception of Galenic balance. I cannot thank everyone who made my stay at the Institute so rewarding, but I must mention two who helped me more than I can say: Caroline Bynum, in her key role as the faculty member in European medieval history, and Marian Zelazny, the indispensable administrative officer of the School of Historical Studies.

In 2007–8, I had the great good fortune to spend a year as a fellow at the Dorothy and Lewis B. Cullman Center for Scholars and Writers at the New York Public Library. During my residence there, in the presence of wonderful colleagues, and under the leadership of its excellent director, Jean Strouse, I wrote most of the three chapters devoted to the question of balance in medieval political thought.

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summer in Princeton as a visitor at the Institute for Advanced Study, School of Historical Studies.

Over the last two years, I wrote the concluding chapter on balance in scholastic natural philosophy, and I composed the book's Introduction and Conclusion. To do so, I relied on the library of Smith College in the summers and on Columbia's Butler Library and the library of the General Theological Seminary in Chelsea during the school year (aided by several course releases from Barnard College). I am deeply grateful to each of these fine libraries and institutions.

In a time when historians and even whole departments of history have begun to be assessed in terms of quantitative production, judged in terms of the number of articles (or even pages) published yearly: when as a result scholars (particularly young scholars) are increasingly urged to publish often, and consequently early; and when academic presses are ever more intent on enforcing shrinking word limits on manuscripts they will accept, I offer my sincere thanks to Barnard College for its unhesitating support over the many years of this project, and to Cambridge University Press for accepting a manuscript that greatly exceeds the length dictated by current norms.

There are, finally, three people in my life to whom I am most profoundly indebted. Two are my sisters, Julie and Carole, who have loved and supported me for so long that they have become, quite simply, a part of me and will always live in my heart. The third is my wife Thea, my true love, my inspiration, and my source of strength. Over these past years she has given more to me and to the writing of this book than I can possibly express in words. I dedicate this book to her with all my heart.



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## Introduction

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A concern with balance and the requirement for balance was central to virtually every intellectual discipline in the medieval period. The ideal of *aequitas*, represented by the scales of justice, lay at the heart of the discipline of law; the vast scholastic literature on ethics came to be centered on the Aristotelian concept of the equalizing mean or *medium*; the balancing of sin against penance and grace was central to the economy of salvation in penitential theory; in mathematics the equation received increased attention after the mid twelfth century with the Latin translation and diffusion of Al-Khwarizmi's *Algebra*, or *Compendious Book on Calculation by Completion and Balancing*. In the discipline of medicine, concern with balance and equalization was, quite simply, everywhere, with the central aim of medical practice universally held to be the restoration of systematic balance (*aequalitas* or *temperamentum*, in their terms) to the body that was losing or had lost it. In literature one can point to the continuing centrality of the ideal of "measure," which signified the maintenance of personal balance in the face of life's trials, and above all to Dante's *Commedia*, which opens with the author lost in the woods at the mid-point (*nel mezzo*) of his life, and ends with a paradisiacal vision of perfect balance, "la forma universale," the cosmic antidote to the personal, social, political, and religious imbalance that preoccupied the author.

In the chapters that follow, I show that preoccupations with balance lay at the core of medieval economic thought (Chapters 1 and 2), medical theory (Chapters 3 and 4), political thought (Chapters 5 to 7), and natural philosophy (Chapter 8), and I argue that an analysis of the forms of balance that are assumed and applied within these disciplines are crucial both to their formation and to their scholarly comprehension. The preponderance and sheer weight of this concern raises the question: is balance a universal and unchanging state or ideal, or can it assume different forms from culture to culture and even within the same culture? Can the sense of what constitutes balance change over time?

My book provides evidence for a series of claims: that balance has a history; that between approximately 1280 and 1360 a radically new sense

of balance and its potentialities emerged and evolved within the upper levels of university speculation; that this new sense of balance served as the ground of speculation in multiple and widely varying disciplines; and that, consequently, changes in the sense and imagination of what might constitute balance had the effect of opening up striking new vistas of imaginative and speculative possibility. I will argue that, from the late thirteenth through the mid fourteenth century, this new sense of balance came to underlie the most innovative and forward-looking speculations within scholastic thought. Within these speculations, whose boldness, scope, and brilliance can still be appreciated today, we can see evidence of a profound re-visioning of the image of the world and its workings.

Countless words and concepts have changed over time and thus can be said to have a history. But balance, I want to suggest, is different. Even in our common understanding today, balance is tied to a generalized and mostly unconscious *sense* – our physical awareness of our bodies and selves within our environment(s). It finds expression as an unworded *feeling* for how objects and spaces are or ought to be arranged; as an *apprehension* of how things properly fit together and work together in the world. The sense we have of its presence or absence in large measure determines our judgment of what is right or wrong, ordered or disordered, healthful or dangerous. Judgments grounded in the sense of balance extend to an exceedingly wide range of subjects, from profound speculations on social, economic, aesthetic, political, and cosmic order down to our unease when we see a picture hanging unevenly on a wall.

Recognition of the wide range of subjects within which the sense of balance comes into play allows us to appreciate its great importance to our psychological, intellectual, and social life, but it also tends to encourage a biological and hence essentialist understanding of it. Since we recognize that balance as an interior sense is natural to ourselves and to all humans, it is hard for us to imagine it as developing within specific cultural contexts and as changing in form over historical time. Balance is balance: we all know what we mean by it; we all trust our sense of it; we never imagine that it is changing or even can change, and we certainly never think of ourselves as agents of its change. This is not only true today: it was the case with every thinker I consider in this book, even as I assign them an active role in the project of reshaping balance and reimagining its potentialities.

Despite the central place that the concern for balance held in virtually every intellectual sphere within medieval thought (or, perhaps, *because* of its inescapable centrality), it was almost never brought to the fore as a subject of discussion in itself. It acted as the pervasive *ground* of thought rather than as a recognizable subject of thought, and as such it exercised its great influence beneath the surface of verbal expression and conscious

recognition. For this reason, modern historians, too, have so far failed to recognize balance in the medieval period (or in any period, for that matter) as a subject in itself or to imagine it as changing in form over historical time, shaped within specific cultural contexts. My project is to bring balance from the periphery to the center of historical inquiry. With all the difficulties involved in historicizing a subject that was never itself a subject of explicit scrutiny and discussion, there are, I hope to show, great advantages to be gained by doing so.

Having made these preliminary claims about balance, I quickly add that the word “balance” (*bilancia*) itself, and its close relative “equilibrium” (*aequilibrium*), only rarely appeared in medieval writings. When they did, their use and meaning rarely transcended their original ties to the common mechanical scale (*bilanx*) and the simple equality of two equally balanced weights (*aequi-librium*) that the scale was designed to find and measure. In the medieval period neither term had gained the metaphorical and mathematical breadth they enjoy today when we routinely speak of fields, systems, or multiple forces “in balance” or “in equilibrium.”<sup>1</sup> In the absence of the words “balance” and “equilibrium,” Latin thinkers used a cluster of related terms to convey many of the meanings we attach to these words today. At the center of this cluster was the word “equality” (*aequalitas*) and its cognates: *aequalis*, *aequus*, *aequare*, *aequabilis*, *aequivalentia*, *adaequatio*, *aequitas*, and others. In addition to these words, other weighty concepts were harnessed to the near-universal concern for attaining and maintaining balance/*aequalitas*. Among these were *justitia*, *temperantia*, *symmetria*, *medium*, *medietas*, and *proportionalitas*.<sup>2</sup> The frequency and plasticity with which these terms were used indicates that the absence in the medieval period of the words equivalent to our “balance” and “equilibrium” in no way speaks to the parallel absence of many of the meanings now conveyed by these words.

While the words and terms expressing the ideal of balance/*aequalitas* held fairly firm throughout the medieval period, the spoken and unspoken meanings attached to these words changed profoundly, with a dramatic

<sup>1</sup> From the evidence of the *Oxford English Dictionary*, it is only in the later seventeenth century that these words come to be applied to a dynamic state in which multiple objects and forces are systematically ordered and integrated within a relational field.

<sup>2</sup> In ancient Greek, *meson* (middle), *mesotês* (medium), *isonomia* (equality), and *symmetria* perform the same function. The situation in Latin is reflected in Charles Du Cange, *Glossarium mediae et infimae Latinitas*, 10 vols. (Graz: Akademische Druck- u. Verlagsanstalt, 1954), where the meanings allotted to *aequilibrium* and all of its cognates (*aequilibratio*, *aequilibritas*, etc.) occupy less than one-quarter of a column (vol. I, col. 1008), while for comparison, the meanings attached to *aequalis* occupy six columns, *aequitas* receives eight columns, and *aequus* eighteen columns. *Bilanx* is allotted a mere six lines (vol. II, col. 1985), with no expansion of meaning beyond the mechanical scale.

shift occurring over the period 1280–1360. The ideal of balance and its association with what is ordered, just, fitting, and healthful remained unchanged. The central place allotted to it in the structure and activity of the cosmos remained unchanged. What changed within the culture of scholasticism was the range of possibility and potentiality attached to the sense of what balance is and can be. In order, therefore, to convey the story of this transformation and to appreciate its effects, it is necessary to go past the words themselves in search of the evolving apprehension or unworded *sense* that lay beneath them – the sense of what constituted the desired state of *aequalitas* (in their terms) or balance (in ours), and the sense of how this state might be achieved and maintained.

The problem is how to talk about and describe the changes in this unworded sense. Although my intent is to link the history of balance to the history of ideas, it is clear that balance in the medieval period cannot be thought of or treated as an “idea” in the normal understanding, since it was never verbalized or communicated directly and intentionally from thinker to thinker. Even the word “concept” carries too many connotations of conscious definition to be applied to it. But although the complex sense of what actually constituted *aequalitas* remained unworded across the medieval period (as it does in almost all pre-modern periods and cultures), it was far from unstructured. Indeed, I want to argue that this compound and complex sense, although open to change and variation, nevertheless possesses a degree of internal cohesion and coherence sufficient to allow it to be recognized and identified as a particular and definable “model,” with the understanding that under certain circumstances, new “models of balance” can take shape and come to supplant (or complement) earlier models.

Just as balance has both a passive meaning (i.e., the equalized end or goal of a process) and an active meaning (i.e., the process of attaining that end), so it can be modeled in two ways. In what follows I designate the desired *state* of balance, “the model of equality,” and the conjoined sense of the *process(es)* through which this state might be achieved and maintained, “the model of equalization.” By using the word “model” I intentionally foreground the *sensible* attributes of shape, working order, and patterned motion that give weight and generative intellectual power to the underlying sense of balance/*aequalitas*. By attaching words like “shape,” “weight,” and “working order” to my understanding and application of the term “model,” words that emphasize the sensible and the particular, I hope to underscore the fundamental differences between my use of the term and the way it is commonly understood and applied in the social sciences today. “Models,” in my application of the term, are not abstractions, not generalizations, and not idealized representations.



As I have come to imagine and apply them, models of equality and equalization are composed of a cluster of interlocking assumptions, both implicit and explicit, both conscious and unconscious, which together form a coherent and cohesive *unity*, characterized by a high degree of internal logic and interior reflectivity. They are highly distinctive and individualized structures, which have a real existence and presence within the mind.<sup>3</sup> Indeed, in the period I study, where the expectation and requirement of balance provided the ground of speculation in discipline after discipline, I have found that models of equality and equalization possessed remarkable power – nothing short of the power to determine both the limits and the possibilities of what could be imagined, envisioned, and comprehended.

Although models are open to profound changes in their elements and in their effects on thought and imagination, they possess sufficient similarities from one to the other to permit comparison and to make possible the recognition of a pattern to their evolution. The way I have come to see it, there was one dominant model that had been shaped and shared by the most innovative and influential scholastic thinkers over the period *c.* 1225–75.<sup>4</sup> Then, in the last decades of the thirteenth century, a new way of modeling equality and equalization began to emerge within university culture that was strikingly different in form and effect from the earlier one it (partially) displaced. For reasons that I discuss throughout the book, this “new model of equalization” is the first of the medieval period that merits being characterized at the same time a “model of equilibrium.” The emergence of this “new” model of equilibrium and the intellectual effects that flowed from it form the central themes of this book.

What, then, are the major distinguishing elements of the new model of equilibrium that emerged and evolved between 1280 and 1360, and how do these elements differ from those that comprised the previously dominant model? For the sake of clarity, I have assigned a separate paragraph to each of the new model’s primary elements. I want to stress, however, that models are active and *working* entities, whose interior logic binds the totality of their elements into a functional unity. Since all the elements work together and reinforce each other, none can be neatly detached and considered in isolation. Thus, the order in which I list the elements can offer only an approximation of the prominence and importance of each to the functioning whole. I limit myself to naming only those elements that are integral to

<sup>3</sup> Given current debates and uncertainties concerning the characterization of “deep mental structures,” I have chosen not to apply the term, as evocative as it is, either to the sense of balance or to models of equality and equalization.

<sup>4</sup> I describe the features of this earlier model in [Chapter 5](#).

the logic that binds the new model of equilibrium. In my description of these elements here, my goal is to be as concise as possible, since they are considered in detail at various points in the body of the text. I note that many of the elements I list here differ profoundly, whether in degree or kind, from those that constituted all previous medieval models of equalization.

- **The potentialities of systematic self-ordering and self-equalizing are recognized and explored.**

The new model is characterized by the striking imagination that the working system is capable of ordering itself and equalizing (balancing) itself simply through the dynamic interaction of its working parts. This apprehension of what might in modern terms be called “dynamic equilibrium” or “systematic equilibrium” sets the “new” model apart from all others that preceded it.

- **Balance comes to be viewed as an aggregate product of systematic activity.**

Where formerly balance had been viewed as a precondition of existence, built into Nature in the Aristotelian scheme, or instilled into creation by a creating God, now the focus shifted to the visualization and exploration of complex functioning systems in which balance (*aequalitas*) came to be seen as an *aggregate product* of the systematic interaction of multiple moving parts within the whole.

- **Focus shifts from the individual part to the systematic whole.**

The new model is marked by a shift in analytical focus from the individual, its individual nature, and its place within a fixed hierarchy or ontology, to the working system of which it is a functioning part. The meaning of the part comes to be subsumed within the meaning of the whole.

- **Within the working whole, faith in the systematic process of interior self-ordering replaces the need for an exterior orderer or overarching ordering intelligence.**

Where the existence of an overarching unitary mind or divine intelligence was the virtual precondition for the establishment of order and equality in older medieval models of balance, in the new model the dynamic intersection of diverse parts within the working whole is sufficient in itself to achieve and maintain *aequalitas*. The imagination of systematic self-ordering and self-equalizing is thus linked to the potentially subversive recognition that the interior logic of the working whole (e.g., the physical body, the body politic, the city, the marketplace, or nature itself) is capable of replacing overarching mind or intelligence as the basis of its order and equalization.<sup>5</sup>

<sup>5</sup> I say “potentially subversive” because for the most part those thinkers who took this recognition furthest (e.g., Peter of John Olivi, Arnau de Villanova, William of Ockham,

- **Aggregation, externalization, and depersonalization come to characterize systematic analysis.**

With the shift in focus from the individual to the aggregate “unity” comes a parallel shift in intellectual interest away from inherent interior qualities and natures and toward the details of motion, activity, and change.

- **The knowledge sought and valued is public in contrast to private knowledge; open in contrast to hidden or secret knowledge.**

The strong partiality toward knowledge that is public, open, and arrived at through universalized forms of reasoning and logic, which characterizes the new model, distinguishes it not only from certain models that preceded it in time, but notably from models that immediately succeeded it in time, in which the personal, the private, and the secret were once again identified with true knowledge.

- **Relational thinking replaces hierarchical thinking.**

Relativity replaces hierarchy as the basis of order and identity within the moving system. The value and identity of individual parts, rather than being fixed by nature, are assumed to be fluid and relational, determined with respect to their ever-shifting position and function within the systematic whole now conceived as a relational field. Order and equalization are seen to come from the interacting parts within the system itself, rather than from the top down. Indeed, the working system possesses no fixed top, bottom, or center.

- **Relational thinking proves to be transformational.**

The focus of analysis shifts from the consideration of fixed and normative values to an ever more sophisticated understanding of the implications of relativist determinations. As thinkers come to recognize that varying points of reference result in widely varying determinations, relativity enters and transforms the realm of perception. Relativistic thinking comes to permeate the understanding of the structure and working principles of all systematic activity, including that of the cosmos itself.

Nicole Oresme) show no signs that they associated it with a limitation of divine power. Indeed, each of these thinkers also contributed to the theological current that asserted the absolute power of God (*potentia dei absoluta*) in the strongest terms. But while they assumed and asserted that God had the power to intervene in every realm of order at any time, they also envisioned and speculated on the workings of self-ordering and self-equalizing systems in naturalistic terms, without reference to this intervention. The distinction between God’s absolute power to intervene and the power that God actually exercised (*potentia dei ordinata*) became one of the great themes of the fourteenth century. On the other hand, speculations grounded in the new model of equilibrium turned, at times, toward explicit critiques of both royal and papal assertions of their authority to impose order from above.

- **Proportionality is redefined and reapplied as the language of proportion and ratio comes to predominate.**

Since proportions and ratios are themselves relations, the language of proportion and ratio comes to dominate mathematical analysis in all disciplines. Ratios and proportions, rather than being taken (as previously) as fixed markers of identity, are now imagined to shift continually in relation to the shifting position and function of parts within the whole. The systematic goal of *aequalitas* is consistently understood in proportional terms that shift with respect to shifting contexts and functions (*aequalitas ad iustitiam*) rather than as an absolute determination fixed precisely at 1:1 (*aequalitas ad pondus*).

- **Lines replace points, fluidity replaces fixity, and concern with the details of motion and change replaces the search for essences and perfections.**

In the ongoing analysis of the self-equalizing system, the ideal of fixity gives way to the acceptance of fluidity; the philosophical search for essences and perfections gives way to the passion to apply quantification and schemes of measurement to change and motion. Measurement by the discrete and numbered point gives way to measurement by means of the graded line or continuous “latitude” (*latitudo*), capable of fluid expansion and contraction and thus applicable to the newly dynamic and complex process of systematic equalization.

- **The conceptual creation of a “world of lines” opens the way to measurement by continuous “latitudes.”**

The image of the world and the working systems that comprise it is transformed from one composed of discrete points and perfections to one composed of ever-expanding, contracting, and intersecting lines – what I call “a world of lines.” The recognition that the continuum was fundamental both to the structure of the cosmos and to its comprehension was a dominant feature of scholastic thought from the beginning of the thirteenth century. But thinkers associated with the new model of equilibrium expand the conceptualization and employment of the line as a medium of measurement and relation to another level entirely. This expansion was signaled by the greatly expanded role and elaboration of the measuring *latitudo* in their speculations.

- **The underlying mathematics moves from arithmetic to geometry.**

Within the new setting of a world of lines, a fluid geometry replaces arithmetic as the basis of both mathematical and philosophical analysis and understanding.

- **The underlying mathematics moves from addition and subtraction to multiplication, while at the same time it moves beyond integers into the realm of exponential powers.**

The mathematics of the new model expands from its ground in addition

and subtraction to comprehend the reality of rapid, even exponential, multiplication. Scholars move beyond working with integers in their analysis and explanation of systematic activity, to work and speculate with exponential powers. Multiplication moves from being feared and shunned as an inherently destabilizing factor (in all but the spiritual realm) and becomes a factor capable of being integrated into the reimagined ideal of *aequalitas*.

- **Estimation and approximation are accepted as legitimate and necessary ways of knowing.**

Given the complexity, fluidity, and relativity built into the modeling of the working system, thinkers began to accept estimation and approximation as legitimate ways of knowing and measuring. Indeed, those who shared in the new model often noted that estimation and approximation were the *only* ways that humans can know and measure entities undergoing constant motion and change. The abandonment of the possibility of full and perfect knowledge accompanied the abandonment of absolutes and individual perfections as the primary objects of philosophical investigation.

- **Probability and probabilistic reasoning are accepted and employed.**

Where in earlier models of equalization the “merely probable” had no ontological status, it attains such status within the new model. No true mathematics of probability developed in this period, but what did develop was the understanding that probabilities represent a real (if discounted) “appreciable value” (*valor appreciabilis*) that can be estimated and employed in the process of analysis. The inescapable indeterminism attached to systematic activity within the new model opened the way for the acceptance and integration of probabilistic thinking.

- **Good function becomes a primary consideration.**

The capacity of the system simply to work and work well (i.e., to maintain itself in balance/*aequalitas*) is taken *in itself* as a sign of its value, without reference to its capacity to work toward ends that conform to traditional or hierarchical ideals. Indeed, the recognition that a system works well compels, in certain cases, the reevaluation of traditional beliefs and ideals that the system either ignores or transgresses. Questions posed increasingly center on the problematic “how does it work,” not on why it works, or to what ideal ends it works, or whether its workings conform to normative expectations. This element activates some of the model’s most transformative effects.

- **“Fittingness” appears as a prime value in itself.**

As parts are judged in terms of their capacity to contribute to the proper working of the whole (rather than with respect to their inherent individual

natures), the determination of what qualifies as “fitting” (*decens, competens, conveniens*) becomes a primary concern, as do questions regarding the specific fit of parts to parts and parts to whole. Good fit in terms of function (*conveniens ad opus*) comes to be recognized as essential to the systematic attainment and maintenance of *aequalitas*.

- **Positive value is granted to difference and diversity.**

This element accompanies many of the conjectures that most clearly reflect the new model of equilibrium. In a number of cases, the proper working of systematic activity is specifically said to depend on the existence of a diversity of parts and powers, with the tension produced by difference and opposition acting as a critical engine of the process.

- **The new modeling of balance is invested with transformative power.**

Within the dynamic of the working system, individual parts that are *unequal* or *imbalanced* or *irrational* or *disordered* in themselves and their natures can nevertheless find balance and equalization in the natural play of objects, functions, and forces that comprise the functioning whole. Scholars begin to speculate that unbalanced, unequal, and even antagonistic parts can actually facilitate the balancing of the whole. This represents a sharp departure from all previous medieval models.

- **Examples of the model’s transformative effects.**

Entities which had formerly been shunned as destabilizing and inimical to the process of equalization, such as doubt, risk, indeterminance, rampant multiplication, the unbounded, the infinite, the mathematically incommensurable and “irrational,” even willed inequalities, were now, within the new model of equilibrium, open to being integrated into the process of producing and maintaining systematic *aequalitas*. Within the new modeling of balance, the individual thing or nature was “freed” in a sense from the necessity of carrying balance within itself, even from carrying meaning within itself. This “freeing” within the new model of equilibrium dovetails with the evolution in this period of philosophical nominalism and the movement toward a minimalist ontology associated with William of Ockham.

- **The new model of balance is differentiated from harmony.**

This final element is distinguished by its absence rather than its presence. Although the ancient ideal of harmony can match up well with certain models of equalization, including all previous medieval models, it does *not* map onto the new model of equilibrium and differs from it in essential ways. The most astute recognition of their differences appears in the writings of the philosopher/theologian Nicole Oresme (*c.* 1320–82), in his speculations on the structure and order

of the heavens.<sup>6</sup> I will let Oresme, whose speculations represent some of the purest instantiations of the new model of equilibrium, outline the differences in his own words, but I add a few words here. Harmony is an unchanging ideal that is built upon the fixed, precise, and knowable ratios of whole numbers. On the contrary, the proportions that constitute *aequalitas* within the new modeling of balance are understood to be fluid and in flux, varying continuously with respect to position within the relational field and the requirements of function. Indeed, the perfect 1:1 equality of two precisely equal and numerable quantities that the mechanical balance achieves (*aequalitas ad pondus*) is recognized again and again to be either absent from or actually inimical to life. One of the striking implications of the new model, and one of the factors that makes its emergence so historically significant, is that those who shared in it and speculated on its terms renounced many of the most intellectually comforting aspects associated with the ancient ideal of harmony: fixity, purity, precision, perfect numerability, perfect knowability, and the reassuring assumption that natural activity conformed to the human mind and made sense in human terms.

I have introduced the elements of the new model of equilibrium here in their most general form. In the chapters that follow, I present the particular forms that these elements take and the particular way they cluster in varied disciplines. What is clear, I hope, is how complex and many-faceted models of balance can be, and how utterly intertwined their elements are: each supports each; each comes back to each. When a cluster of concepts link to form a meaning-web of such complexity and reflectivity, its weight and impact is multiplied far beyond the sum of its parts. It becomes more than a collection – it becomes, in their terms, a “unity” (*unitas*), a cohesive working whole. It possesses a characteristic feel, a characteristic motion, a characteristic rhythm, which can be sensed and experienced. As the cluster takes on these quasi-sensible qualities of weight, motion, and rhythm, it becomes, in my definition, a “model.” Models, in turn, due to their inner cohesion and high degree of interior reflectivity, possess sufficient weight and force to alter and redirect perceptions and thoughts. Moreover, the continuation of models (including the new model of equilibrium) over decades leads me to surmise that the weight they accumulate also gives them the capacity to persist – to maintain their status and structure in the face of all but the most profound perturbations to their formative environments.

<sup>6</sup> Oresme’s speculations in this area appear in [Chapter 8](#).

In every case, I hope to show that each of the elements listed above, taken both singly and as parts of an interconnected and integrated model of balance/*aequalitas*, underlay – indeed, actively directed – the most innovative speculations that appeared across widely varying intellectual disciplines over the period 1280–1360. The phenomenon of the model’s appearance across these widely divergent fields, along with its power to organize and redirect essential insights when it does appear, points to the highly significant role that the history of balance plays in the history of ideas in this period and, I suspect, in all periods. That many of the elements that constitute the “new” model differ markedly from those that had constituted all previous medieval models of equalization, adds further to the importance of pursuing a *history* of balance, rather than merely considering it in terms of its basis in biology or brain function. At the same time it raises the question: how does a change of this magnitude occur? What might lie behind the transformation of balance, given that the subject itself was never raised, never explicitly recognized, and certainly never debated within the intellectual culture of scholasticism? And given that models of equalization lie beneath the level of consciousness and are rarely if ever communicated directly or subjected to criticism, how do they come to be shared by thinkers across disciplines? How can we explain the direction they take and the forms they assume?

I have already suggested that models of balance/*aequalitas* have a real presence and exert a real force within the human mind. At the same time, I want to argue that even though they are never explicitly recognized or verbalized, these models are both shared and shaped within particular intellectual cultures. The construction of the model is to a large degree a common, if unconscious, project. To the extent that individual thinkers share with others an intellectual inheritance, a socioeconomic and political environment, and an institutional setting with particular institutional goals, values, and training, they are open to communally sharing (and shaping) a model of equalization. At the same time, it is highly unlikely that every member of such a community will come to possess the same model or to possess it in the same degree. The fully realized form and effects of the “new model of equilibrium” are present in only a portion of scholastic writings from the late thirteenth to the mid fourteenth century. It is significant, however, that the scholastic writings in which the model does appear are those that are commonly recognized today as being particularly acute, astute, and forward-looking. Indeed, I want to argue that there is a direct connection between the capacity to sense the new potentialities of balance inherent in the new model of equilibrium and the capacity to move to the forefront of this very competitive intellectual culture. Those who had fully intuited and could apply the new model



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