
Lost in Translation: An Epistemological Exploration of the Relation between Historical Analysis and the NOMINATE Algorithm

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The NOMINATE algorithm has become the most important analytical tool used in the study of the United States Congress. As such, congressional scholars have developed a great many social conventions, practices, and assumptions that enable interpretation of the statistical artifacts the algorithm produces. However, as many of these scholars recognize, serious problems emerge whenever we try to translate these statistical artifacts into language and thus attempt to assign them meaning in historical analysis. These problems are irresolvable because they reside in the very construction of the algorithm itself.

This symposium is intended to introduce the NOMINATE algorithm and data set to the American political development (APD) community.¹ While several ways in which the NOMINATE system might be used in historical research have been suggested, some of the limitations of the algorithm have not yet been fully addressed. This might perhaps be because the presuppositions underlying NOMINATE have become so familiar to scholars of Congress that they have become almost second nature. However, those same presuppositions are probably quite foreign to those who knew little about the NOMINATE system before reading these articles. For example, concepts such as “first dimension,” “ideal point,” and “policy space” must be learned by most members of the APD community in much the same way that a new

language is learned: a process that begins by emulating how the speakers of that language themselves deploy the concepts.² For their part, most members of the NOMINATE community have become so accustomed to these concepts that they no longer interrogate or otherwise question how they utilize the specialized language that has developed around the NOMINATE system.

Because the two communities are thus oriented toward the NOMINATE system in very different ways, I will start from scratch in an exploration of

I would like to thank Ruth Bloch Rubin and Anthony Chen for guidance and advice. All mistakes are, however, my own.

1. I will use “American political development (APD) community” to denote those who self-identify with that subfield and “NOMINATE community” to designate those who routinely use the algorithm. Although these communities are, as the contributors to this symposium generally recognize, distinct in some respects, they also overlap because some scholars belong to both groups and thus share a common interest in historical analysis that accurately portrays and interprets the political past. While my use of these labels indicates the respective general theoretical and empirical orientations of the two communities, my critique of the NOMINATE system is intended to address their shared theoretical and empirical concerns.

2. I will refer to the articles in this symposium by the names of their authors. For example, “Bateman and Lapinski” will refer to David A. Bateman and John Lapinski, “Ideal Points and American Political Development: Beyond DW-NOMINATE.” On p. 169, Bateman and Lapinski write, “If the policy space were stable, the liberalizations to the [Social Security] program should be accompanied by midpoints that moved to the liberal side of the space.” On p. 144, Devin Caughey and Eric Schickler similarly ask, “How should congressional scholars, particularly those with a historical bent, choose an approach to measuring spatial change over time?” Only after extensive induction into the norms and conventions of the NOMINATE community could someone fully understand the metaphorical reasoning in these passages. Even after this induction, the actual content of these passages would remain metaphors with an unspecified (and perhaps unspecifiable) connection to the empirical reality they purport to represent. The induction into the NOMINATE research community thus requires both training in how to use the terminology of the community *and* the acceptance of an obscuration of how that terminology actually applies to empirical reality.

what might be entailed by wider utilization by the APD community. Much of what follows focuses on the folkways and norms that have grown up around use of the NOMINATE algorithm because these have shaped the ways in which patterns generated by the system have been interpreted and thus turned into terms and concepts that might enter into historical research. Throughout this essay, I will insist on establishing a connection, if one is possible, between (a) the construction of the algorithm and (b) the language deployed by the NOMINATE community to interpret the statistical artifacts the algorithm produces. Because the statistical artifacts produced by the algorithm are analytically sterile unless they can be interpreted in language, their interpretation is the essential step that must be made before they can contribute anything to historical analysis.

I make three points in this article. First, I maintain that there is no logical connection between the construction of the NOMINATE algorithm and the language deployed in the interpretation of the statistical artifacts that it produces. Many, if not most, in the NOMINATE community recognize the lack of a logical connection but nonetheless insist that the statistical artifacts can be interpreted. However, the act of interpretation must impute meaning by effectively linking the artifact to its symbolization in language. If we cannot do that (and all the contributors agree, in one way or another, that we cannot), there is no reason why we should concede that interpretation is possible.

Second, while members of the NOMINATE community have developed alternative constructions of the algorithm as they attempt to establish a logical connection with language, their critiques of the NOMINATE system are almost always superior to the alternatives that they offer in its place. In part, this is because their critiques often situate the judgments and interpretations of the conventional historical literature as “the true form of political reality” that their revision of the algorithm is intended to emulate. They then interpret the extent to which the statistical artifacts produced by their revision emulate the conventional literature as evidence of the validity of their findings. However, this emulation does not create a logical connection between their revision of the NOMINATE algorithm and the language of the conventional historical literature any more than a correlation would imply causation.

Third, because there is no logical connection between the algorithm and the interpretation of its products in language, it is impossible to link the numerical coordinates and two-dimensional displays of these products to social and political reality. In fact, most attempts to forge such a link presume ostensible characteristics of social and political reality (such as the absence of leader–follower relations and perfect knowledge of the future) that are simply untenable

even if they could (which they cannot) stand as interpretations of NOMINATE coordinates and displays. In a weaker form, some of these points have been made by the other contributors to this symposium. However, even though my colleagues have carefully and skillfully considered them, I maintain that their critiques have not fully joined these issues.

These themes will run throughout this essay. In the beginning, I will focus on the relationship between the visual displays generated by the algorithm that have so powerfully enticed congressional scholars and the conceptual language that has grown up around that enticement. Although these displays have helped persuade many scholars to incorporate the NOMINATE algorithm in their research, their status as representations of historical political reality is dubious at best. The problem is not with the construction of the algorithm, which will always and infallibly produce statistical artifacts, but lies, instead, with yawning chasm between those artifacts and the language in which we try to interpret them.³

I will also discuss the role assigned to ideology by those who use the NOMINATE system, including what the concept means to them and exploring whether that meaning can be usefully deployed in historical analysis. The basic problem is that the ideological beliefs of members of Congress have often been conceived as tautologically identical with the statistical artifacts produced by the NOMINATE algorithm. In addition to a general inattention to what “ideology” might mean in congressional politics, this tautological identity necessarily implies that ideology is and has been a trans-historical alignment in national politics that has carried the same meaning throughout American political development. Even very careful attempts to conceptualize ideology independent of the NOMINATE system and to historically contextualize political beliefs have only further demonstrated the basic difficulty of attaching meaning to the algorithm’s statistical artifacts. Even the most skillful attempts to reinterpret those artifacts as representations of either partisan or ideological “polarization” have been more successful as revelations and critiques of inherent problems in the NOMINATE system than they have been in resolving them.

In the last section I will examine some of the implications of the methodological individualism that pervades the construction and use of the NOMINATE system. The statistical construction of the algorithm and the very language that has grown up around the NOMINATE system assume that each member, responding to her or his beliefs or self-interest, behaves

3. Thus, Phil Everson, Rick Valelly, Arjun Vishwanath, and Jim Wiseman (hereinafter Everson et al.) are only partially correct when they state that “NOMINATE . . . reliably scales legislators by their locations in so-called issue space within each and every Congress (p. 98).” Although the algorithm is certainly reliable, the question is whether these locations actually have meaning.

autonomously from every other member. For example, “ideal points” are highly individualistic constructs that precisely correspond to the ostensible array of unique beliefs and self-interests of each member. Such notions preclude recognition of the collective interaction and interpersonal relationships that we know underpin much of way in which the beliefs and self-interests of members are created. For instance, all narratives of policymaking in Congress, regardless of their historical context, recognize that not all members are created equal. Some members are leaders, sometimes very powerful leaders, who can create preferences among their followers simply by announcing what they personally want to do. Other members are followers who take their cues from those leaders and thus subordinate their beliefs to the preferences of that leader.

All of these critiques focus on the relationship between the statistical artifacts produced by the NOMINATE algorithm and the analysis of political behavior in language. Taken to an extreme, the NOMINATE system has manufactured a synthetic historical reality in which the existence of a trans-historical ideological belief system and the absolute autonomy of member decisions from social relations have become widely accepted principles of historical interpretation. One of the questions to be addressed is whether or not this synthetic historical reality is tenable on even its own terms.

THE RELATIONSHIP BETWEEN LANGUAGE AND THE NOMINATE ALGORITHM

Let me begin by briefly reviewing what the NOMINATE algorithm actually does. For any set of roll calls in which individuals publicly cast votes, the algorithm processes these votes (the raw data) into numerical coordinates that basically relate each individual’s voting record to every other individual’s voting record.⁴ The resulting numerical coordinates are often (but not always) converted into a two-dimensional display. What the analyst receives, in terms of output from the statistical processing of the data, is thus a two-dimensional display of “dots.” Each of these dots (hereafter referred to as “points”) is a statistical artifact produced by the algorithm by mathematically processing an individual voting record in tandem with other individual voting records.

The algorithm itself tells us nothing about what these points represent with respect to empirical reality. In fact, even when we know that the data

4. How the algorithm actually processes votes need not detain us here. As the other articles in this symposium illustrate, there are many alternative ways to tweak the algorithm, each of which alters the manner in which individual voting records are related to one another.

that have been processed are composed of roll calls, a point produced by the algorithm cannot be simply traced back to an individual voting record because the calculation of the statistical artifact is dependent upon the other individual voting records included in the data set. That means that the exclusion of some individuals or some votes from the data set will alter the array of points in the two-dimensional display. What the algorithm produces is simply an array of points in a two-dimensional frame that, when first inspected, has no intuitively obvious meaning to the observer.⁵

The algorithm will produce numerical coordinates and, thus, two-dimensional displays out of any data that can be translated into binary categories. For example, the binary categories could be whether or not it rained on particular days in a given year, the individuals could be different weather stations in a country, and the data set could be the rainfall record at each of these stations. The NOMINATE algorithm could process this data set into coordinates and displays in the same way that it processes roll call votes, and the analyst, when presented with the statistical artifacts thus produced, would have no way of knowing whether it was votes or rainfall that had been processed. Let us take a moment and allow the implications of these observations sink in. When the observer views the two-dimensional display produced by the algorithm, there is no intuitively obvious meaning arising out of the array of points. The array produced by rainfall patterns will look the same, for all intents and purposes, as that produced by roll call votes. The observer would not be able to distinguish between the two displays simply by viewing them.⁶

When someone adopts the social conventions and interpretive norms of the NOMINATE community, they begin to “see” the two-dimensional array in much the same way as someone might “see” a blot in a Rorschach test.⁷ And, just as the same Rorschach

5. For example, see Figure 8 on p. 110 of Everson et al., and imagine that the points in the two-dimensional display did not have partisan labels.

6. Those with long experience with the patterns produced by roll call votes in the U.S. Congress might object that they would be able to recognize those patterns when juxtaposed against those derived from weather stations. But they would simply be assuming that rainfall would not produce the same patterns while failing to demonstrate that the algorithm had conveyed political meaning in producing the roll call displays. To understand why that is the case, imagine that the same analysts were presented with patterns produced by roll calls in the Israeli Knesset and asked to distinguish them from rainfall patterns arising from monsoons in India. If the analysts still insisted that they could tell the difference, they would be either supremely overconfident or had already studied displays that they knew were produced by one or the other of these data sets.

7. If the analysts knew the data set contained roll call votes, they would “see” the array one way. If they knew the set contained rainfall records, the array would be “seen” another way.

test cannot be used across different cultures, the interpretation of these two-dimensional displays does not travel between different research communities. The individual must first be inducted into NOMINATE research protocols before he or she is able to correctly interpret the statistical arrays produced by the algorithm. If there were, in fact, a logical connection between the statistical artifacts produced by the NOMINATE system and the language deployed to interpret them, this induction would not be problematic; it would, as the NOMINATE community often insists, be training in a “science.” However, because there is no logical connection between the artifacts and the interpretation placed on them, the invitation to join the NOMINATE community is an invitation to adopt a subjective way of seeing the world that this community has culturally created. We may still want to do this, but our reason cannot be that the community has created a new and better “science.”

We now turn to how these social conventions and interpretive norms are created within the NOMINATE community. The first step is to insist, as we have done, upon the logical independence of (a) the NOMINATE algorithm as a statistical processor of data from (b) the assignment of meaning to the numerical coordinates and two-dimensional arrays it produces. This is not as easy as it sounds because the NOMINATE community has thoroughly identified the statistical artifacts produced by the algorithm with the meaning assigned to them by their social conventions. Distinguishing between the artifacts and that meaning requires that we carefully disentangle that identification.

We should start by reminding ourselves that the algorithm would produce coordinates and displays even if they were, in fact, meaningless. However, the NOMINATE community has generally insisted that the numerical coordinates and two-dimensional displays must mean something even when they disagreed on what they meant. As a result, there are many alternative explanations of what the coordinates and spatial displays might mean or represent, but almost no recognition of the fact that, as we shall see, the choice between meanings is essentially arbitrary in some cases and tautological in the rest.

The labeling of the points is often the critical interpretive decision made in NOMINATE analysis. For that and other reasons, we should begin with the bare coordinates and their associated two-dimensional array of points. For example, the points in a two-dimensional display can be denoted by letters indicating party identification (e.g., “D” and “R”) and the display would then ostensibly present an array of points representing Democrats and Republicans. We would then, in most instances, set about interpreting the array in terms of party programs or organizational loyalty. Alternatively, we could assign the points ideological labels (e.g., as determined by support scores for policy positions endorsed by the Americans for Democratic Action).

The letters in the array might then be “L” and “C” for “liberals” and “conservatives.” We could create similar labels for the urban, suburban, and rural constituencies of the members; gender; region (e.g., North, South, Midwest, and West); or support or opposition for a presidential administration. We could do the same thing for the individual attributes of the members, such as age and hair color.

However, none of these alternative labeling possibilities resolves the basic question of whether or not the coordinates and the spatial displays have, in and of themselves, any inherent meaning in language.⁸ When we base our interpretation of the displays on the labels we have adopted, we are often implicitly or explicitly importing meaning from outside the algorithm. For example, because we already know from studies that do not use the NOMINATE algorithm that political parties organize much of legislative policymaking, we might consider labeling the points “D” and “R” to be reasonable. On the other hand, labeling the points with the hair color of the members might seem senseless for the same reason. The important point is that, if we reason in this way, we are “importing” the rationale from outside the algorithm. There is nothing in the NOMINATE system that can direct us to a “correct” labeling decision.⁹

Labeling is not only arbitrary. It is also surreptitiously deceptive because, once they are labeled, the points appear to represent stable facts. A point, for example, can be labeled “Democrat” if the member belongs to that party, and in one sense, the label is stable because that label always attaches to the point produced by the algorithm from the member’s voting record. However, the point thus labeled is unstable in that it moves around in the two-dimensional display if the data set is modified by adding or subtracting votes or members. The stability of the label and the instability of the point cannot be reconciled (e.g., a member does not become more or less of a “Democrat” as a change in the data set moves the point around the display by altering the calculation of the numerical coordinates). Put another way, because the labels do not represent a property processed by the algorithm, they are stable. They are simply names attached to the points. However, the points themselves are not stable because they are a malleable product of how many and what kinds of votes are included in the data set.¹⁰

8. This is probably what Everson et al., mean when they say that “NOMINATE scores are *not* true values of anything real” (p. 106). This statement, however, leaves readers in a quandary as to what they think the scores actually are.

9. There is, in fact, no correct labeling decision because the statistical artifacts produced by the algorithm do not directly correspond to any observable aspect of social and political reality. However, as discussed toward the end of this article, that is a slightly different point.

10. One way of thinking about this problem is to imagine a group of people attending a cocktail party. Now further imagine that these people are arrayed in clumps in a room according to

Labels are thus theoretically distinct from and logically independent of the statistical artifacts produced by the algorithm. And for that reason, the visual conflation of labels with the points in the two-dimensional display conveys a misleading certitude with respect to the meaning of the points. And what is true of party names is also true of the individual whose voting record is processed by the algorithm. The individual is always the same individual and the voting record is always the same voting record, but the point produced by the algorithm is always conditioned upon (and thus partially produced by) the other individual voting records in the data set. In sum, labeling the coordinates and points in a NOMINATE display does not attach meaning to the statistical artifacts because the choice of labels is arbitrary, and, related to that fact, the labels themselves do not name properties processed by the algorithm. The only things processed by the algorithm are sets of binary data relative to other sets of binary data.

However, the NOMINATE community can assign meaning to these numerical artifacts and two-dimensional displays by creating definitions. When, for example, the authors identify one of the two-dimensional displays produced by the algorithm as “the first dimension,” they are creating a definition and thereby announcing that they will use the term in that way.¹¹ There is no ambiguity here because the term merely describes a particular geometrical display and the algorithm will regularly and infallibly produce these displays.¹² Similar definitions have

their social relationships with the other people, with individuals occupying certain spots depending on their relationships with the others. Now even further imagine that one of these people walks out of the room (i.e., is removed from the data set). At least some of the remaining people would change positions in the room because the social relationships available to them had been altered. If a cocktail party algorithm could recalculate the positions of the remaining individuals on the basis of their social relations to one another, this would be a very interesting and potentially fascinating exercise in understanding how cocktail parties evolve. However, it would be the dynamics of the group that would be explained, not the individual identities and personal histories of people attending the party. One of the major problems with the NOMINATE algorithm is that it behaves as if it is analyzing evolving social interaction in a cocktail party but purports to interpret the points occupied in the room as if they were rigidly autonomous identities.

11. Everson et al., contend that the “fact” that there are two dimensions “was a discovery of the NOMINATE algorithm” (p. 107). To label the dimensions produced by the algorithm a “discovery” is to claim that these artifacts were and are somehow immanent facts in the structure of the world, as opposed to the tautological products of statistical processing. They thus misidentify an essentially arbitrary definition as something independently existing in social and political reality.

12. The necessity of linking theoretical concepts to empirical reality has frustrated model builders for decades. For example, in “Modernizing Political Science: A Model-Based Approach,” *Perspectives on Politics* 5, no. 4 (December 2007), Kevin Clarke and David Primo maintain that models should be regarded as a “representational objects and less like linguistic entities” (p. 742). If we do

been created, for example, for spatial distance, ideal points, and choice space. However, as we shall see in the next section, serious problems arise when we attempt to attach empirical meaning to these terms.¹³

“PARTY POLARIZATION” AND THE NOMINATE SYSTEM

One of the most common terms in the NOMINATE system is “polarization.” The term, for example, plays a central role in Frances Lee’s article in this symposium, in which she argues that NOMINATE coordinates demonstrate that political parties in Congress during the Gilded Age were highly polarized. However, she also contends that, even though the NOMINATE evidence reveals a statistical pattern that is conventionally labeled as “polarized,” the pattern (and thus the term itself) does not necessarily indicate that the parties were ideologically contentious.

As she notes, the conventional definition of “polarization” within the NOMINATE community

rests upon a theoretical model that envisions (1) a choice space in which policy alternatives can be ranged along a continuum, interpreted generically from left to right or, more specifically, as ‘conflict over economic redistribution,’ and (2) legislators who hold policy preferences along that continuum and who will vote for the alternative closest to their preference. Parties become polarized when the preferences of the members of the two parties move further away from one another in this choice space. NOMINATE and other methodologies of ideal-point estimation rest upon assumptions that congressional roll call voting conforms to the spatial model. These scores cannot be meaningfully interpreted outside of these assumptions.¹⁴ If there are types of issues that cannot be situated in this choice space or if lawmakers

this, they contend, models are not true or false but, instead, more or less useful. The problem is both (a) that models *are* linguistic entities (because they are described in language and have no meaning or existence outside of language) and (b) that their application through use is also thoroughly ensconced in language as well, with the consequence that they are also true or false in at least two senses. First, to the degree to which they purport to be, in fact, models of reality, they must represent that reality in language. Second, to the degree to which they allow successful prediction, the models must link their analytical lexicon to terms depicting empirical reality (pp. 741–53).

13. On p. 149 of their article, Bateman and Lapinski note that one of the “obstacles for integrating” the NOMINATE system “into historical analyses” is that “the meaning of the dimensions estimated by DW-NOMINATE is unclear and unstable over time.” However, in the rest of the article they appear to hold out hope that it might still be possible to link the first dimension to language describing empirical political, including historical, reality.

14. As in this case, most work utilizing the NOMINATE system assigns the label “score” to the coordinates produced by the algorithm and thus, somewhat surreptitiously if unconsciously, converts the bare statistical artifacts into another metric such as “ideology.” However, while Lee does call the artifacts “scores” in this passage, she is otherwise calling the practice into question.

split along party lines for reasons other than their individual policy preferences, the methodology will still generate coordinates, but they will not be valid or accurate as indicators of members' *policy* preferences or, taken collectively, of the parties' ideological polarization on national issues. (emphasis in the original, p. 119)

This is elegantly stated and correct as far as it goes. Let us, however, approach the issues Lee raises from a slightly different angle. The underpinning "assumptions" Lee describes are, as we have seen, themselves logically outside the NOMINATE system.¹⁵ However, she accepts them insofar as they define a "choice space" in which partisan "ideal points" can be estimated. It is the empirical content of these ideal points that Lee contests because she maintains that party "polarization" during the Gilded Age was largely devoid of policy content and was therefore not ideologically organized or motivated. By dumping all roll calls into one data set, NOMINATE mixes together decisions that have policy content with those that lack such content. The result, Lee implies, is a statistical artifact that represents neither partisan nor ideological polarization.¹⁶ If we were to separately

15. For example, the existence of an ideological continuum along which "conflict over economic redistribution" can be arrayed is an assumption that arises entirely outside of the algorithm itself. If we introduce such assumptions, we can always attach meaning to the statistical artifacts generated by the algorithm. The question is whether these assumptions are logically entailed by the construction of the algorithm itself. If not (and they are not), then they are essentially arbitrary. As a result, we should search for a meaning that *is* logically entailed by the algorithm. To have empirical meaning, that entailment must both be logically deducible from the construction of the algorithm *and* be deployable in an analytical statement (e.g., in language that describes actual human behavior). As we shall see, the algorithm does not have these properties.

16. Although Lee does not actually say so, her critique strongly implies that mixing together different kinds of roll calls into one data set results, when processed by the algorithm, in coordinates that have no meaning whatsoever. See, for example, this passage on p. 126:

The methodologies scholars use to infer the policy distance between the parties cannot distinguish between partisan and ideological conflict. NOMINATE is a data reduction technique that elegantly summarizes members' voting behavior; it does not explain the reasons for that behavior. Any vote that divides the parties from one another will map onto NOMINATE's first dimension, even if it involves only a dispute over a patronage appointment or a distributive logroll with no larger principles of national policy at stake. When members divide along party lines in their voting behavior, NOMINATE and other vote-scaling methodologies will return estimates in which a single dimension seems to structure members' behavior, regardless of the true dimensionality of the space.

This passage more or less concedes that the algorithm will generate statistical artifacts regardless of whether or not those artifacts mean

calculate partisan ideal points on those decisions that involved the allocation of patronage, the seating of contestants in congressional elections, investigations of administrative malfeasance, and so forth, we would, Lee appears to contend, see that polarization was primarily driven by party competition for power and the distributive benefits of political victory. Lee thus contends that the NOMINATE algorithm can generate ideal points that can mean something but that the NOMINATE community has, in this instance, not been very careful in determining what that meaning might be.

Let us assume that we could divide all roll call votes into those that were ideologically organized and motivated and those that were solely intended to maximize the prospects for a party's victory in elections.¹⁷ We would then have two sets of ideal points, one for the ideological data set and one calculated for partisan roll calls. At this point, we could ask Lee why the ideal points produced by the algorithm for one of these data sets should be regarded as more representative of political contestation in the Gilded Age than those in the other data set. The NOMINATE algorithm cannot give us an answer to this question. Lee herself can provide an answer only by referring to a larger, historical literature that, in fact, does not utilize the statistical artifacts of the algorithm.¹⁸

But, again, that is not the important question. The important question asks what the ideal points mean even after the data sets have been purified by separating policy votes from partisan decisions. On the one hand, even a "purified" set of ideological roll calls can fail to include ideological issues that are clearly salient in national politics. For example, the House of Representatives was remarkably reluctant to vote on issues related to the Vietnam War during the early years of that conflict, even though large protests and demonstrations were occurring in much of the nation. Similarly, race segregation in the South produced almost no votes in Congress for long stretches of the late nineteenth and the first half of the twentieth centuries. On the other hand, party organizations can be polarized in terms of the policy positions they assume in national party platforms and yet be internally divided in Congress on those very same policies

anything. Perhaps more importantly, note the reference to an apparently Platonic notion of a "true dimensionality of the space." How would we come to know this true dimension? What could it possibly reference with respect to the social reality of politics and political contestation?

17. I actually think this is impossible because party members often believe and act on the belief that ideological consistency maximizes the prospects for electoral victory. I go along with Lee here solely for the purpose of interrogating her argument.

18. And, even then, Lee has been selective in the weight she places on the works in this literature, ultimately placing more emphasis on those that agree with her thesis. The literature itself, as she notes, is divided and contentious.

(because some of their members cast votes against those policy positions). If this were the case, the NOMINATE algorithm would again fail to pick up policy polarization.¹⁹

In sum, despite Lee's best efforts, the statistical artifacts created by the NOMINATE algorithm will never align very well with ideological contestation between the parties in empirical reality. In response, we might attempt to recalibrate the data set in some way so that it accurately reflects ideological contestation actually taking place in the nation at large. How the analyst might do this without abandoning any possibility that the NOMINATE algorithm might produce something meaningful with respect to ideological polarization is not at all clear.²⁰ At this point, an insistence that the NOMINATE algorithm can be useful as a measure of ideological polarization between the parties might appear rather fetishistic.

But there is an even more fundamental problem with respect to the relation between the coordinates the algorithm produces and their representation as aspects of empirical reality. What does the algorithm empirically reference, for example, when the party coordinates are closer together or further apart? We could define the former as "less polarized" and the latter as "more polarized," but, as is true of all definitions, this would be a tautology (and, as tautologies go, a rather unsatisfactory one in that the coordinates would move further apart or closer together depending on the inclusion or exclusion of votes in the data set).²¹

But this is part of the broader problem that has already been discussed: If we cannot logically connect NOMINATE coordinates and spatial displays to language, these statistical artifacts cannot be integrated into historical analysis. As it stands now, NOMINATE analysts essentially point to statistical arrays produced by the algorithm and say "look at this." That is profoundly *not* a Wittgensteinian moment in which we, as viewers, confront the brute, irreducible

reality of the world.²² And, for that reason, the yawning chasm between the nature of the NOMINATE system's statistical artifacts and their potential utility in historical analysis is still as wide as ever.

INTERPRETATION OF THE FIRST DIMENSION AS IDEOLOGY

Lee appears to be making two separate points with respect to the relation between ideology and the NOMINATE system. On the one hand, she contends that the major political parties rarely engaged in ideologically driven policy conflict during the Gilded Age, and thus the statistical artifacts produced by the algorithm cannot be measuring ideological beliefs during this period. As a result, party polarization (which is defined within the NOMINATE system and subsequently revealed by the numerical coordinates generated by the algorithm) cannot have originated in ideological conflict. On the other hand, she also proposes that NOMINATE coordinates sometimes indicate ideological conflict and sometimes do not, depending on the type of policy or policies under analysis.²³ These two points are, of course, related in some ways, but the first is a substantive claim about the nature of public policy during the Gilded Age, and the other is a theoretical claim concerning the relationship of the algorithm to political reality—whether the first one is true or false is independent of whether the second is true or false. However, both claims require that "ideology" be clearly defined. In order to know whether or not most partisan competition was ideologically driven and whether or not NOMINATE coordinates can, potentially at least, indicate ideological belief, we first need to know what ideology is.

Lee avoids the task of defining ideology by maintaining that partisan ideological alignments can only be revealed by policy differences, and since there were no policy differences between the parties in the Gilded Age, the major parties could not have been ideologically polarized.²⁴ However, she nonetheless recognizes that most research using the NOMINATE system does contend that the numerical coordinates usually, if not always, indicate ideological sentiment.²⁵ In fact, Keith Poole and Howard

19. See pp. 125–126 of Lee's article.

20. See, for example, Caughey and Schickler, pp. 138. While Caughey and Schickler offer many interesting and important observations on the relationship between progressivism and party organizations in Congress during the 1920s, I would contend that their discussion of the algorithm itself, including their attempt to distinguish NOMINATE coordinates from ideology, does not appear to contribute to a better understanding of that period.

21. The tautology arises because the definition of the terms is mutually self-referential: Polarization *is* this particular relation between numerical coordinates *and* this particular relation between numerical coordinates *is* polarization. The pattern defines the term and the term defines the pattern. Within the social conventions observed within the NOMINATE community, this identity is commonly accepted. For example, Everson et al., contend that NOMINATE generates "measures . . . that reveal and track party polarization over time" (p. 98). However, as Lee also contends, most interpretive practice attempts to distinguish between statistical artifacts and the reality that they purportedly represent. To do so, we need an independent conception of polarization arising out of some other body of empirical evidence.

22. This is a reference to the *Tractatus*, not Wittgenstein's later work. See Ludwig Wittgenstein, *Tractatus Logico-Philosophicus* (New York: Routledge & Kegan Paul, 1961; originally published 1921).

23. Lee, pp. 125, 126.

24. In Frances Lee, *Beyond Ideology: Politics, Principles, and Partisanship in the U.S. Senate* (Chicago: University of Chicago Press, 2009), Lee has offered a definition of ideology in connection with her critique of the NOMINATE system (pp. 26–27, 49–53). However, that discussion does not directly address the problems raised in the text.

25. Caughey and Schickler suggest that "it is often possible to make use of the scores without giving them an ideological interpretation" (pp. 128–129). However, they do not say what the

Rosenthal, the creators of the algorithm, entitled their major treatise *Ideology & Congress*. In that book they define ideology in this way:

Although the continuum is an abstraction, it is convenient to use the word *ideology* as a shorthand code for these [voting patterns produced by the algorithm]. Henceforth in this book, we use *ideology* as a shorthand in the sense intended by Converse (1964) in his seminal essay on belief systems. That is, voting is along ideological lines when positions are predictable across a wide set of issues. . . . We can think of the continuum of ideological positions as ranging from the Left to Right, or from very liberal to moderate to very conservative.²⁶

However, as Bateman and Lapinski correctly observe, the definition of ideology adopted by Poole and Rosenthal is not compatible with the conception that Converse proposed.²⁷ And because Poole and Rosenthal do not provide any other definition of ideology, the ostensible link between ideology and the statistical artifacts produced by their algorithm is, by default, tautological. They say as much on the first page of *Ideology & Congress*: “The spatial model of voting . . . is the technical foundation of our model. For short, we refer to it as the ideological model.”

However, Poole and Rosenthal do state that the “clusters” that appear on the two-dimensional displays produced by the algorithm “basically” represent “conflict over economic redistribution” and, by implication, that this conflict is synonymous with ideologically organized struggle.²⁸ This claim is inductive in the sense that it arises out of a superficial and clearly selective examination of the policy issues that have generated the visual displays they reproduce in their book. This inductive process ensures that the patterns must conform to their conception of ideology, because the arrays, in fact, define what ideology means. Thus, as Bateman and Lapinski correctly note, “the conceptualization of ideology in DW-NOMINATE has no intrinsic or stable connection with policy positions.” They also note that Poole and Rosenthal have referred to “the two-

coordinates mean if they are not given an ideological interpretation or when and if they might be meaningless. The latter is particularly important to consider because the analyst must demonstrate that the coordinates can have meaning before meaning is assigned.

26. Keith T. Poole and Howard Rosenthal, *Ideology & Congress* (New Brunswick, NJ: Transaction, 2007), 3.

27. Bateman and Lapinski undercut the reference to Converse in their article by observing that “where Converse [emphasized] ‘ideas and attitudes,’ Poole and Rosenthal define ideology as the stable continuum that enables a prediction of who will vote with whom—it is ‘fundamentally the knowledge of what-goes-with-what’—rather than a set of ideas or issue positions that are characterized by their functional interdependence” (p. 153). Also see note 22. Philip E. Converse, “The Nature of Belief Systems in Mass Publics,” in *Ideology and Discontent*, ed. David E. Apter, (New York: Free Press, 1964), 206–61.

28. Poole and Rosenthal, *Ideology & Congress*, 5.

dimensional space in a number of different and not entirely compatible ways” in various publications, including ideology, party loyalty, and as “part of the ‘perceived reality’ of contemporary America.”²⁹

Bateman and Lapinski go on to say that “the labels ‘liberal’ and ‘conservative’ . . . entail issue positions” and that “to characterize” the numerical coordinates in this way risks anachronism, “especially for periods in which liberalism and conservatism labels might be less relevant axes of political alignment.” They then discuss the voting record of Mississippi Democrat Samuel A. Witherspoon (1911–15), asking whether it makes sense to say that he was more or less liberal than Dennis Kucinich or Adam Clayton Powell, Jr.³⁰ All of what they say is correct, but the more important point is that the conventional interpretation of NOMINATE coordinates treats liberalism and conservatism as trans-historical ideals that guided the alignment of members of Congress even when the very terms as labels for political attitudes were unknown to them. For example, in the early nineteenth century, members of Congress would have been at least bemused to find that their policy positions were somehow unconsciously shaped by an ideological alignment that has its primary roots in the New Deal.³¹

But the problem goes beyond mere anachronism because the notion of a trans-historical alignment also contradicts our current understanding of ideology. This becomes clear if, for example, we were to compare the voting records of William Jennings Bryan (Democrat of Nebraska) and William McKinley (Republican of Ohio).³² In a two-dimensional display produced by the NOMINATE algorithm, Bryan’s

29. Bateman and Lapinski, p. 152. Also see an unpublished manuscript by David Bateman and Josh Clinton, “A House Divided? Roll Calls, Polarization, and Policy Differences in the U.S. House, 1877–2011,” p. 11. Caughey and Schickler similarly note that “NOMINATE scores provide a statistical summary of legislators’ voting behavior. The scores themselves do not have any inherent meaning independent of the theoretical and substantive framework that we use to interpret them” (p. 128). This is equivalent to saying that we should impute meaning to the scores by accepting the conventions of the NOMINATE research community. While they encourage members of that research community to be more critical in their interpretation of the coordinates within those conventions, they still endorse the prior assumption that NOMINATE scores must mean something more than “a statistical summary of legislators’ voting behavior.”

30. Bateman and Lapinski, p. 153.

31. For example, Everson et al., contend that “the NOMINATE algorithm . . . produces scores akin to an imaginary interest group rating machine that had been in operation since the First Congress” (p. 98). We would have to wonder what ideological qualities this imaginary interest group would have to possess in order for this clearly trans-historical claim to be valid.

32. Bryan and McKinley never served together in the House of Representatives. However, the former was in the 52nd Congress (1891–1893), and the latter belonged to the 51st Congress (1889–1891). Because those using the NOMINATE system routinely compare members in adjacent or nearly adjacent Congresses by relating their voting patterns to other members, the fact that their

ideal point would be found far to the left of McKinley's, with both of them securely ensconced in the huddles composed of their respective party colleagues. After inspecting this display, the NOMINATE analyst would conclude that Bryan's ideology was "very liberal" while McKinley was "very conservative." What does it actually mean to say, using the NOMINATE algorithm, that Bryan was much more liberal than McKinley? In the first instance, all that the statement means is that the numerical coordinates produced by the NOMINATE algorithm place Bryan a relatively large distance to the left of McKinley on a two-dimensional display.³³

The contradiction with our current understandings of ideology can be attributed to the profoundly anachronistic assumption that "liberal" and "conservative" ideologies meant the same thing in the late nineteenth century as they do in our own time. This is easily demonstrated when we recall Bryan's opposition to black suffrage in the South and consistent support for individual state sovereignty in most policy areas. McKinley, on the other hand, voted the other way on these things.³⁴ However, we would commit the same error if we tried to maintain that Bryan was really a conservative or that McKinley was really a liberal. The fact is that whatever ideology might mean over the course of American political development, it must be historically contextualized. NOMINATE analysts, instead, usually assert that the algorithm has (somehow magically) converted all contextual historical experience into a single metric, and that the content of that metric (in terms of what ideology actually *is*) can only be revealed through an examination of the coordinates the algorithm produces.³⁵

periods of service did not coincide does not present a problem in this comparison.

33. It is not at all clear what the coordinates would mean if they did not somehow measure ideology. The most common alternative explanation would be that they measure party loyalty (see Caughey and Schickler, p. 135), which would, from an analytical perspective, be rather pedestrian because much simpler and less ambiguous statistical measures of party loyalty in congressional voting are available. So we will stick with the ideological interpretation in this example.

34. Prior to and during the Civil War, policies such as the Homestead Act, federal aid to land grant colleges, and the creation of a national banking system, not to mention opposition to the expansion of slavery, would have been deemed "conservative" because, as an empirical pattern, the supporters of these policies were located on the right side of the array. (For displays on the alignment of slavery, see Poole and Rosenthal, *Ideology & Congress*, pp. 121–27. The other policies during the Civil War period generate very similar displays.) Similarly, during the 1890s, support for federal aid to education, federal pensions for Union soldiers, the national bank system, and federal enforcement of voting rights would have been deemed "conservative" positions. Without going into details, it should be obvious why deeming these policies "conservative" wreaks havoc with the pretense that ideology, as Poole and Rosenthal have defined the term, possesses significant policy consistency or attitudinal coherence throughout history.

That assertion more resembles a spiritual belief than it does a serious analytical claim.

Bateman and Lapinski still hold out hope that NOMINATE coordinates might better "approximate 'ideology'" if "more information" were "integrated into the estimation procedures." They suggest, for example, that "ratings from external organizations" or "the written opinions of newspaper editors and columnists" might be projected "into the same space as members of Congress" and thus "more precisely capture what is meant by liberalism or progressivism."³⁶ Caughey and Schickler proceed somewhat differently, arguing that the conventional claim that

first-dimension NOMINATE scores reflect liberal–conservative ideology in contemporary politics is greatly bolstered by the finding that first-dimension scores are highly correlated with ideological scales that were created precisely to distinguish liberals from conservatives, such as Americans for Democratic Action (ADA) and American Conservative Union (ACU) scores. Given that such interest-group scores are far more temporally limited than NOMINATE—while also suffering from important methodological weaknesses, such as the problem that interest groups may choose votes that generate 'artificial extremism'—the case for preferring NOMINATE scores to these measures is a strong one.³⁷

Their argument proceeds in three steps. In the first, they contend that NOMINATE coordinates must reflect ideology because they correlate well with the roll call ratings published by the ADA and the ACU. Then they note that there are imperfections in those roll call ratings. In the final step, they then conclude that NOMINATE scores must thus be even better than ADA and ACU roll call ratings. The first step is correct: The correlation is usually high. The second step is also correct: The roll call ratings are imperfect. However, the final step cannot be deduced from the first two for a number of reasons.

For one thing, the high correlation between NOMINATE coordinates and ADA/ACU ratings does not imply that the former are ideological in character. It simply means that they correlate. A lot of things, in fact, correlate with roll call ratings, but they are not inherently ideological in character. But, more importantly, the authors assume that the imperfections attending calculation of the NOMINATE coordinates are less debilitating than those associated with roll call

35. Caughey and Schickler are on the right track when they "highlight the limitations of NOMINATE scores for analyzing ideological conflict and change over the broader sweep of American history" because they do not respect ideological alignments "as they were understood by political observers at the time" (p. 129). However, they still insist that the coordinates represent ideological positions if the ideological content is historically contextualized.

36. Bateman and Lapinski, p. 162.

37. Caughey and Schickler, p. 129.

ratings. How would we know that, unless we independently knew what ideology was and were thus in a position to compare NOMINATE coordinates and roll call ratings to that notion of ideology?

As noted earlier, Lee points out that the indiscriminate mixing of “partisan” and “policy” issues in the NOMINATE system makes mush of the coordinates as a means of assigning meaning to “party polarization.” For the same reason, the indiscriminate mixing of ideological and nonideological issues makes mush of the coordinates as a means of assigning meaning to “ideology.” We could attempt to separate out ideologically constructed issues from the other roll calls, but that would require a conception of ideology independent from the coordinates. And if we had that, we would no longer need either roll call ratings or NOMINATE coordinates. The basic problem is that most NOMINATE users want to use the coordinates to assign ideological labels to members without defining or otherwise specifying the content of ideology.³⁸ If we knew what ideology was (e.g., how policy decisions could be interpreted on an ideological spectrum), we could place roll calls on the left–right dimension (so forming a scale) and thus place legislators on a line after examining their voting records. If we do not know what ideology is, we cannot do this—and we cannot do it with the NOMINATE coordinates as well. There is no mysterious alchemy in the algorithm that somehow allows us to perceive and thus recognize ideology when we cannot otherwise comprehend it. And if we can independently comprehend it, then it is the NOMINATE coordinates that should be interrogated to see whether or not they represent the ideological predictions of members of Congress.

Before moving on, we should also note that there is at least one sense in which the ADA or ACU ratings cited by Caughey and Schickler are much more meaningful than NOMINATE coordinates, and that is because members of Congress, as well as those who rate them, actually pay attention to them. Although ADA practice has since changed, for years legislative staff serving members belonging to the liberal wing of the Democratic party selected the votes used in ADA ratings. They were politically informed and certainly had some feel for the corridor politics in their respective chambers. When used to construct an ideological measure, the selection of roll calls by these staff members was actually dictated by “practical politics,” not the application of abstract principles to policy alternatives. As Linda Fowler put it,

38. To a much greater extent than in explanations of mass voting behavior, ideology has become an analytical “primitive” in the study of Congress: an explanatory variable that is either left unexplained or, when the analyst is compelled to offer an account of its origins and content, folds back upon itself in the form of a tautology. For the increasingly salient role of ideology as an explanation for congressional behavior, see Lee, *Beyond Ideology*, chap. 2.

the rating process is a game of professionals played by lobbyists and legislators who know each other by reputation as well as by personal contact. The staff members involved in establishing the parameters of issue selection constantly assess legislator’s scores in light of their own experience. Names and scores are linked closely in their minds and prominent members in both chambers often provide the litmus test of a given bill’s significance. . . . In this respect the scores take on a substantive meaning within the context of a legislator’s overall relationship with the group. A known friend is understood if he strays from the appointed positions . . . the tendency among interest groups [is] to rate roll calls for the purpose of identifying their friends and exposing their enemies.³⁹

As one ADA official confessed, “Somehow on the Hill, liberalism and conservatism is an *experienced* fact, but how it happens is mysterious. Lobbyists, legislators, and their staffs interact and modify each other’s views in a triangular process. We all take cues and give cues.”⁴⁰ Ultimately, it is the evolving social and political relations constituting these groupings of people who have declared themselves to be liberals or conservatives that determine the policy meaning of ideology.

Noting that someone “needs to process the chaos of the world into ideological order,” David Mayhew describes “the Capitol Hill community [as] a kind of collective Madame Defarge, weaving day after day an ideologically ordered tapestry out of whatever material comes in.”⁴¹ More than forty years ago, Converse similarly described this process, noting that

new issues are constantly arising that are difficult before the fact to relate to such a [liberal/conservative] yardstick. . . . [In most of these cases,] elites that are known on some other grounds to be “liberal” or “conservative” ferret out some limited aspect of an issue for which they can argue some liberal-conservative relevance and begin to drift to one of the alternative positions in disproportionate numbers. Then, either because of the aspect highlighted or because of simple pressures toward party competition, their adversaries drift toward the opposing position. Thus positions come to be perceived as “liberal” or “conservative,” even though such alignments would have been scarcely predictable on logical grounds.⁴²

39. Linda L. Fowler, “How Interest Groups Select Issues for Rating Voting Records of Members of the U.S. Congress,” *Legislative Studies Quarterly* 7, no. 3 (August 1982): 405, 406.

40. *Ibid.*, 405, 406, 412.

41. David Mayhew, “Events as Causes,” in *Political Contingency: Studying the Unexpected, the Accidental, and the Unforeseen*, ed. Ian Shapiro and Sonu Bedi (New York: New York University Press, 2007), 124.

42. Converse, “The Nature of Belief Systems,” 257, n. 15.

In these passages, Mayhew and Converse have suggested a very different conception of ideology from the conventional notion resting upon individual beliefs. Since this socially produced understanding of ideology is radically different from the individualist notion underlying most interpretations of NOMINATE coordinates, let us take a moment to set out how this alternative conception might be constructed.

When viewed as a socially produced feature of politics, ideology becomes a set of cultural values exhibited, shared, and mutually understood by members of a self-identified group (as opposed to individual beliefs organized and disciplined by a logically ordered system deducible from abstract principles). There are several empirical and theoretical advantages to such an interpretation. For one thing, these cultural values would be, in a sense, suspended between the members of a self-identified group in such a way that (a) they would be collectively shared among the members of the group without requiring that a member either be cognizant of all the values (e.g., an individual could belong to a group without being aware of or otherwise subscribing to all of the group's values); (b) individual members of the group could serve as exemplary bearers of these values in such a way that their actions alone (not the logic of their explanations for their actions) could create or substantiate these values; (c) individuals would, in that sense, take cues from other members of the group when taking a political position (as opposed to making a decision by referring it to an internal, personal belief system); (d) over time, the trajectories of individuals and their groups would influence their identities in the sense that individuals could move between groups, thus changing both their own political identity and the composition of the groups that they left and the ones that they joined; and (e) that would mean that the cultural values associated with any particular group would "drift" over time, in some instances even coming to assume values that contradicted those that had been held sometime in the past. All of these are interpretive advantages insofar as they better explain how (what is conventionally termed) ideology has actually operated in American politics.

In the absence of an explicit conception of ideology as a logically deductive system derived from theoretical first principles, "liberalism" and "conservatism" are thus tribal insignia as much as they are representations of formally defined belief systems.⁴³ As a result, those

43. Although he accepts interest group ratings as "measures of legislative preferences" that can be used in formal models of legislative behavior, Keith Krehbiel does not accept an ideological interpretation of the ratings. However, he does find them useful for determining the "ideal points" of members of Congress. Although we might, as indicated in the next section, quibble with his conception of ideal points, his interpretation of the ratings as indicators of preference clusters is otherwise consistent with the social interpretation in the text. See Keith Krehbiel, "Deference, Extremism, and

who calibrate the ratings carefully select the roll calls so that their friends and allies in Congress are assigned very high (often perfect) scores.⁴⁴ Because both staff members and the members they serve calibrate their behavior so as to be awarded these very high scores, ADA ratings have shaped "social reality" on Capitol Hill, even though they are suspect as representations of ideological belief systems. In rather sharp contrast, there is no evidence that any member of Congress has ever tried to manipulate their NOMINATE coordinates by changing their position or abstaining on a roll call. The algorithm's statistical artifacts are thus inferior to interest group ratings both as representations of ideological belief and as influences shaping the social reality of members of Congress.⁴⁵

Assuming that the ratings of organizations that monitor congressional voting can and actually do represent ideological beliefs arising out of the practice of politics, should the ideological scales that they publish (a) be interpreted in their own historical context as referencing beliefs that developed out of specific political conflicts (and thus have meaning primarily within those conflicts) or (b) be discarded in favor of a trans-historical spectrum of left-right, liberal-conservative belief systems whose influence on political actors can be detected from sheer patterns of political behavior even if the guiding principles of these trans-historical ideologies remain unknown? The first option privileges the particularity of historical conflict and the explicit understandings of political actors in their own time. It is inductive

Interest Group Ratings," *Legislative Studies Quarterly* 19, no. 1 (February 1994): 61–77.

44. ADA scores are thus not the empirical manifestation of ideological beliefs that are somehow immanent in reality. They are, instead, a reflection of the political priorities of an organization that, among other things, presents its interpretation of "liberalism" to the public as a claim on the attention of an audience. We should not, for that reason, be attempting to discern whether NOMINATE or ADA ratings or any other scoring method more accurately and completely encompasses "ideology" but, instead, be studying how and why these interpretations are deployed in political contention.

45. Caughey and Schickler recognize that the ratings of progressivism that they compare with NOMINATE coordinates play a role in congressional social and political reality in a way that the latter do not. However, they also write, "This is not to say that political actors' perceptions of the relevant cleavage necessarily trump other potential conceptualizations" (p. 132, n. 19). Maybe so, but should not the social perceptions of progressivism by members of Congress trump the brute imputation of ideology as the substantive meaning of NOMINATE scores? For example, when the Conference for Progressive Political Action (CPPA) "identified seventy-five roll call votes in the Senate from 1919 to 1924 that it used to evaluate the progressive bona fides of senators" (p. 132) should not this be accepted as evidence that (1) the relevant individuals in the CPPA possessed social knowledge of group relations that, in turn, dictated their selection of these roll calls; and (2) that this same social knowledge of group relations shaped the policy positions for those senators who oriented themselves, positively or negatively, toward the CPPA? And, for this reason, is not this evidence superior to that derived from the brute imputation of ideological significance to NOMINATE scores?

in that we must gather the necessary evidence before reconstructing ideological belief. Only after reconstructing that belief should we attempt to create ideological scales out of roll call votes. The second of these (i.e., the brute imputation of ideological content upon NOMINATE coordinates) is deductive in that the construction of the algorithm and the calculation of the coordinates precedes (and often substitutes for) historical research.

The first option asks what political actors actually believed within a particular historical period, including the possibility that those beliefs might have been logically inconsistent in some respects. The second imputes beliefs to political actors by assuming that those beliefs can only be revealed through statistical analysis and, because policy content is irrelevant, cannot detect whether or not ideological beliefs may have been, at least in part, logically inconsistent. With respect to this narrowly framed set of interpretive possibilities, Caughey and Schickler prefer historical contextualization. Although they do not explicitly identify inconsistencies in the way progressivism was constructed in the 1920s, the possibility is implicit in their description of the heterogeneous progressive coalition of the 1920s.⁴⁶

METHODOLOGICAL INDIVIDUALISM AND NOMINATE TERMINOLOGY

As is the case with much of the contemporary literature on legislative behavior, research utilizing the NOMINATE algorithm rests almost exclusively on methodologically individualist assumptions. Members of Congress, for example, are assigned coordinates as

46. Their dual commitments to historical context and the NOMINATE system, however, sometimes entangle their argument in circularity. For example, Caughey and Schickler write, "Clearly, the linear conservative trajectory implied by first-dimension DW-NOMINATE does not match Bilbo's biographer's assessment that the senator's liberalism 'waxed rather than waned' in the late 1930s before he turned sharply to the right in the 1940s" (pp. 141–142). They then note that the numerical coordinates produced by their alternative item response theory (IRT) algorithm does emulate the pattern described by Theodore Bilbo's biographer. However, if we are evaluating "fit" according to the account provided by Bilbo's biographer, then we already know that Bilbo's trajectory was something like the IRT model. That makes the model redundant. Even more importantly, the successful emulation certainly does not imply that the IRT model is a better or more sophisticated measure of Bilbo's ideological trajectory than that derived from the biographer's thick knowledge of the senator's historical context and social relations. In fact, in terms of then contemporary ideological alignments, Bilbo might even be (and probably was) a deviant instance and the success of the emulation would, in that case, be deceptive as evidence that the IRT model is generally superior to the NOMINATE algorithm. Caughey and Schickler also say that the "point of the foregoing analysis is not that the IRT estimates are correct and the DW-NOMINATE scores are not" (pp. 142–143). In this case, we should ask what is the meaning of "correct"? The self-understanding of political actors (including the interpretation of their biographers if they had one) or brute deductions from the algorithm? If the latter, how would we choose between the IRT and NOMINATE algorithms?

individuals, and these coordinates are interpreted in terms of individual attributes such as ideological beliefs, loyalty to a particular party, alignment with a regional bloc (such as the Southern Democrats of the 1950s), or attitude toward racial segregation. As a result, roll calls are interpreted as representing the independent calculations of individual members who decide how to vote after assessing such things as the ideological content of a policy, the expectations of their constituents, the position their party has taken, the opportunities for logrolling with colleagues, and so forth. That individual members are often autonomous agents as they participate in the legislative process is an entirely safe assumption, well-documented in primary research. However, each of these contexts in which they operate as autonomous agents entails relationships that embed the member in a social community.

For example, the member often, if not usually, evaluates the ideological content of a policy proposal in terms of how other members, interest groups, and constituents interpret the proposal. The assignment of an ideological label to a policy is thus a socially constructed decision (in part because ideology is at least as much the product of group membership as it is a logically deductive, formal theoretical system). Similarly, constituents communicate their desires to the member who then must balance the conflicting requests they present. The persuasive authority of the party leadership and the negotiations attending logrolling proposals are likewise social in nature. The individual member of Congress is thus suspended in a web of social relationships that (a) create the context within which the member evaluates policy content, (b) confer a public identity in the home district, (c) modulate his or her standing within the party caucus, and (d) give rise to the member's reputation as someone who is both willing and able to broker competing legislative priorities.

The language, concepts, and interpretations associated with the analysis of roll call voting in the NOMINATE community reduce all this complexity into the personal calculations of legislators, individuating their thoughts, beliefs, and actions from those of other members. This atomization suppresses study of the linkages between members, including hierarchical relations between leaders and followers, mutual cooperation between members within small groups, the emergence of shared understandings and interpretations in the legislative arena, and the detection of reciprocal cooperation across policies. Because the radical individualism of the theoretical model assumes an equality of influence and an autonomy of decision across all individual members, it distorts our understanding of the process through which legislation is crafted. Most importantly, the actually quite demanding assumption that members carry a fully elaborated ideological belief system into their necessarily cooperative and group-oriented legislative deliberations simply

misconstrues the way in which members mutually construct and act upon their policy preferences.

The concept of an “ideal point,” for example, theoretically strips a member of all interpersonal, cooperative (or competitive) relations, reducing policy choices to individual selection from a universe of objectively defined possibilities.⁴⁷ The fundamental problem with this concept again concerns language. In order to be used in historical analysis, we must know what the labels applied to the statistical products of the algorithm actually mean. From that perspective, we must ask: What is an ideal point? We can certainly identify it as a statistical artifact plotted as a dot in a two-dimensional frame, but what is its meaning in language (and, thus, in historical research)? One answer might be that an ideal point sums up all the factors that give rise to a member’s policy preferences and, thus, identifies an equilibrium in which all the conflicting demands on the member are in some kind of balance.

Using rational choice terminology, we can restate the conventional definition of an ideal point more formally as representing that bundle of goods that maximizes the utility of an individual in a particular setting (the setting determining the choices available to the individual).⁴⁸ We must then identify the setting. Let us load the dice by making the setting Congress and then stipulating that the procedural rules and knowledge of the preferences of the other members (we would need all of that) determine what sets of choices are available to individual members (not all conceivable policies, for example, but only those that are presumed to be possible in some sense). The ideal point for a member of

Congress might thus be the maximization of utility with respect to the bundle of possible policies that might come before the institution during a given session.⁴⁹ A curious analyst might then ask three questions about this ideal point:

1. Can an ideal point be identified outside of the algorithm that produced it (say, by evidence from the political life, thoughts, or public speech of the member combined with a thick historical description of the institutional context within which he or she made choices)? In other words, does it correspond with something else in the political record that might independently support the interpretation of the statistical artifact as an ideal point?
2. Is the member aware of his or her own ideal point? This is highly unlikely because, among other things, the future contains, at any point in time, at least some of the things in the bundle. If the member could accurately predict the future (i.e., possessed perfect information with respect to future policy opportunities and choices), this would not be a problem.⁵⁰ However, the member cannot accurately predict these things. We can certainly say that a member attempts to roughly anticipate what might happen with reference to future policy decisions but that rough anticipation is emphatically not the same thing as an ideal point.⁵¹

47. Bateman and Lapinski make a somewhat similar point when they say that DW-NOMINATE “scores are agnostic to other sources of information, and thereby impose an assumption that legislator voting patterns are invariable to historical context, to institutional change, and to policy development” (p. 149). This indifference to historical context thus ignores all those social relations that position the member in an ongoing legislative process. Lee similarly hints at the social context of legislative deliberations when she notes that “congressional voting is highly structured, not subject to much cycling or instability. Put more simply, members of Congress are members of political parties, and parties are coalitions of societal interests” (p. 126). Here Lee suggests that the social context within which members of Congress deliberate discourages the appearance of otherwise theoretically possible forms of preference revelation (such as those underpinning Arrow’s impossibility theorem).

48. In some respects the theoretical status of an ideal point is similar to that of a market price in a rational expectations perspective. Both assume the processing of perfect information over an infinite range of possibilities and alternatives in which no one, not even the analyst, can identify what those possibilities and alternatives might be. For that reason, the cognitive mechanisms through which individuals evaluate legislative choices in order to maximize the utility of their policy bundle necessarily remains a mystery. That mystery parallels the rational expectations approach to markets where traders are said to rationally maximize both the individual and social utility of a product through the mental processing of information that is not fully available to any of them.

49. Bateman and Lapinski propose, as an alternative, that each member “has a comparable ideal point for every week in which he or she was a sitting member and in which Congress was in session” (p. 166). Following that logic, each member could also be assigned an ideal point for every moment in which they cast a vote. This would more exactly align the NOMINATE coordinates with their ostensible theoretical meaning but would also basically maintain the tautological identity between the scores and the content of an ideal point.

50. Everson et al., skirt this issue when they state that “legislators, being professional politicians, know rather precisely what they want—and by the same token what they do *not* want out of the legislative process. In other words, they have what is known as an *ideal point* when they go about their business of negotiating” (p. 99). The question is not whether members of Congress have plans and priorities when they legislate (they certainly do), but whether they know precisely what they want and have perfect knowledge with respect to how to get it. If they do not have these things, then an ideal point is nothing but a Platonic fiction.

51. When a member weighs the utility of present and future policy choices, he or she must consider the uncertainty that necessarily attends future policy possibilities. We can assume that the member somehow discounts future utilities. But we cannot assume that the member can do anything more than assign a range of probabilities to these future possibilities as he or she calculates that discount. That makes the bundle of utilities itself a range. The conception of an ideal point is thus rendered incongruous with reality because it purports to precisely identify the summed

And if we are attributing something to a member of which he or she is unaware, what is that something? And how does an ideal point determine member behavior if, as we might colloquially surmise, it only lurks in the member's unconscious or, perhaps more charitably, intuitive feel for a situation? Put another way, what does that plotted point mean if the member it purportedly represents cannot consciously comprehend an "ideal policy bundle"?

3. Do all members of Congress or political actors in general make choices solely on the basis of their personal utility arising out of those choices? On this last point, we might reasonably ask: Aren't some members "followers" of other members (we would then label the latter "leaders")? In extreme cases, would not the ideal points of these followers become identical with (or at least heavily influenced by) those of their leaders? Even if this were only the case with respect to some of the choices presented to a member, wouldn't the conception of an individual ideal point become distorted beyond all recognition?⁵²

Within the NOMINATE system, the ideal point that identifies the balance between competing legislative alternatives is often defined as the ideology of the member. Bateman and Lapinski are well aware of the problems associated with using roll call records to identify such an ideological ideal point and recommend that NOMINATE coordinates be calculated for

utility of a member's bundle of present and future policy choices. Bateman and Lapinski implicitly recognize this problem when they say, "The DW-NOMINATE scores show the southern Democrats beginning to drift rightward during the 1920s, but . . . these scores are problematic because information from later in southern Democrats' careers will bleed into [the] earlier period" (p. 158). This bleeding into the earlier period is not problematic because members of Congress do not anticipate a future when considering their votes in the present *but because they anticipate that future imperfectly*, and for that reason, their behavior in the future cannot be read backwards as a precise representation of how they anticipated that future in the past. Their solution to this problem is simply to statistically assume that members do not anticipate a future. Caughey and Schickler tackle the problem from a different angle but make even less tenable assumptions (pp. 139–140).

52. We would have to first calculate the ideal point of the leader and then assign it to the follower as well. However, in this social relationship, the leader must also take into account the policy desires of the follower because amassing and maintaining a substantial following maximizes the leader's ability to reach his or her own legislative goals. This dialectical relationship has no stable solution if we (reasonably) assume that the leader is also attempting to attract new followers as well. In fact, as we well know, one of the most common traits of effective leaders is the ability and willingness to respond opportunistically to unanticipated events.

subsets of roll calls on related issues. They illustrate their argument by comparing the relatively liberal results that J. William Fulbright of Arkansas would earn on foreign policy with the very conservative coordinates he would be assigned on civil rights (pp. 163–164). While their suggestion is well-intended, there are several problems with their recommendation.

First, NOMINATE coordinates would no longer represent a member's unified worldview because he or she would have many ideologies, each one computed over a different subset of roll calls. It is not at all obvious what a many-ideologies theoretical framework would look like. Second, nominally identical policy decisions should not be placed in the same issue subset if they were recorded in very different historical periods. In fact, the placement of a policy in an issue category is often problematic even in the same historical period. Is abortion, for example, a civil liberty deducible from a right to privacy or a criminal act because it entails the taking of life? While such difficulties might sometimes be evaded by constructing categories that encompass both possibilities (and, thus, the analyst would not have to choose between them), they make a mockery of the concept of ideology itself, which necessarily recognizes that the construction of a policy decision by the member is a profoundly moral act, not something immanent in the natural world. In general, we should accept that the construction of any classification scheme for policy issues is not a discovery of an immanent order somehow residing in social reality but, instead, rooted (at best) in historically contextualized understandings of how policies fit together or (at worst) ideologically grounded interpretations of the correct way of sorting individual issues into categories.

In order to be integrated into historical analysis, an ideal point must be capable of translation into language. Since it cannot be so translated, this statistical artifact is fatally flawed. We more or less concede this flaw when we admit that individual members cannot comprehend their own ideal points as they legislate. This is not just because the comprehension of all the potential policy bundles at a given point in time is simply beyond the capability of the member. And it is not just because the future is both relevant to these bundles and radically uncertain, or that some members lead and other members are led. It is because the NOMINATE system simply cannot state, in language, what the statistical artifact represented by the plotted dot actually *is* in terms of politics. Put another way, ideal points are not ideal representations of anything in historical or political reality. Whatever meaning can be assigned them is solely the product of the social conventions that have arisen within the NOMINATE community.⁵³

53. Caughey and Schickler say that the NOMINATE system's "summarization" of legislators' voting behavior "takes on additional

SOME ADDITIONAL THOUGHTS ON THE RELATIONSHIP BETWEEN LANGUAGE, NOMINATE, AND HISTORICAL ANALYSIS

Historical analysis differs in several ways from mainstream study of political behavior. For one thing, the social context of political action changes over time, so that what appears on the surface to be the same behavior in two historical eras in fact conveyed a very different meaning for both the actors and those who monitored their behavior. For this reason, we, as modern day analysts of historical behavior, must be aware of a potentially misleading reliance on empathy as a guide or framework for interpreting political action in the past. Because the social context of the past is different, our own psychological presumptions and calculus of decision making are not the same as they were for the people who we choose to study. We should be eternally wary, for example, of an interpretation of historical behavior that begins with “a reasonable person would have chosen to do X,” in which that reasonable person is not historically contextualized. One of the most important preconditions for historical political analysis is thus the re-creation of the self-understanding of individuals as they participated in politics. In this section, I want to examine two issues: (a) the relation between the casting of a vote and the intention of the voter and (b) the relation between the language in which we describe the link between vote and intention, on the one hand, and the statistical apparatus in which we evaluate that link.

The recorded vote in Congress is the unit of analysis that constitutes the very foundation of the NOMINATE system. In one sense, roll call votes in Congress may be the most empirically well-defined and certifiably evidenced acts in all of politics. Their exactitude as empirical facts arises as the intentional product of the highly formal settings in which they are recorded. As institutionally recognized preferences, Congress has laid down rules and precedents that specify when, where, how, and by whom votes may be cast. Members are simply ignored if they do not conform to the ritual forms set out in these rules and precedents. For example, a member who attempts to cast a vote when another member’s name is called may audibly announce his or her preference, but the institution (more specifically, the ritually designated officer whose task it is to record votes) will ignore that declaration unless it is announced at the

proper time (i.e., after the member’s name is called). However, whether a member shouts out a vote or sends a written note to the front desk does not matter. Nor does it matter if a member prefaces his or her vote with oral commentary or simply states his or her decision. In these and other ways, the institution strips the casting of a vote of everything that is considered to be extraneous to the precise enumeration of formally eligible preferences.

The casting of a recorded vote in Congress is thus a profoundly socially constructed act, one of the most thoroughly policed behaviors in all of human society. And, for that reason, members are rapidly and universally disciplined into conformance with such institutional rules and practices. As a collateral benefit of their formality, we are presented with a data set of unsurpassed exactitude.⁵⁴ And the formal rules, precedents, and practice of Congress have succeeded in eliminating almost all of the variation in these votes that might otherwise be introduced by differences in historical context.⁵⁵

However, the socially constructed exactitude of the recorded vote in Congress emphatically does not imply that we know what the individual member intended when he or she cast a vote.⁵⁶ This intention can (and does) vary in at least three dimensions: personally (when the intention of the voter varies across different votes), contemporaneously (when the intentions of voters vary from one voter to another in the same Congress), and longitudinally (when the intention of voters varies across historical eras). The task of historical analysts is to determine, as best they can, what the motives of a member might have been when he or she cast a roll call vote and, thus, what

54. The rules and precedents of the House of Representatives, for example, operate as a kind of algorithm, in that they simultaneously (a) produce the units of analysis (i.e., votes) and (b) process those units into an outcome (i.e., an institutional decision). The first step translates individual behavior into a statistic, and the second translates the statistic back into behavior (e.g., shared recognition of the decision). However, these steps are tautological in the sense they are the product of formal definitions (as opposed to hypothetical statements about empirical reality).

55. For a sampling of the precedents that have strictly defined the practice of voting, see Asher C. Hinds, *Hinds’ Precedents of the House of Representatives* (Washington, DC: Government Printing Office, 1907), volume V, sections 5970, 5981, 6046, 6047, 6048.

56. It is only the behavior (i.e., the vocal announcement of a vote or the electronic recording of a pushed button) that is unambiguous, not the relation between the casting of a vote and the intention of the voter. Whether or not the member makes a mistake in translating his or her preference into these ritual behaviors or whether or not the member actually understands the decision upon which he or she is voting is not empirically evidenced. When votes are properly cast within this ritually defined setting, the institution simply does not care (in the sense of recognizing this behavior for the purposes of making a collective decision) whether members are accurately translating their personal preferences into the formal votes that they cast. In other words, whether or not members actually know what they are doing when they cast a vote is irrelevant to institutional recognition as long as the formal proprieties are observed.

meaning to the extent that the statistical assumptions of the scaling model faithfully represent the decision-making process of legislators” (p. 143). While the nod toward the social experience of legislators is welcome, the implication that the statistical assumptions of the NOMINATE algorithm *could*, even theoretically, “faithfully represent the decision-making process of legislators” is, as shown by their own analysis, untenable.

meaning should be attached to that vote. In some contexts, the decision at stake might have had profound implications for the electoral fate of a major party. In others, the policy might have carried very important distributive benefits for the districts of some members and been all but inconsequential for the rest. Ideology, in the sense of normative understandings of what kind of country the United States was to become, may have motivated the casting of votes in other cases. And these things mattered across all three dimensions: individual members simultaneously held and hold ideological, partisan, and constituency interests to which they responded when they voted; the motives of members vary within a single vote; and motives certainly varied across historical eras.

The reason that a roll call vote is so exactly and unambiguously recorded is precisely because all of its social conditions and contextual requirements are set down in a language that all the members share and understand. There is thus a one-to-one correspondence between a vote (as a unit of analysis) and its description as one of many particular behavioral acts. There is, however, almost always a sizable gap between an individual member's intention when that vote is cast and what we know of that intention. Closing all of that gap is impossible, but we can narrow the discrepancy by paying close attention to the historical context of a decision, the identity of the member, the leader–follower and social relations in which the member participated, and the personal reports of the member. Or, alternatively, we can widen that gap by using the NOMINATE system.

As several of the contributors to this symposium have noted, the NOMINATE algorithm merges all member votes into the same data set. When the statistical artifacts produced by the algorithm are interpreted, the analyst selects, more or less arbitrarily, which meaning to assign to the votes as if all the members shared a common motivation in casting them. But that point has already been made. The important point here is that unparalleled exactitude of the units of analysis in the roll call data set has been more than equaled by the almost unrivaled imprecision of their interpretation within the NOMINATE system. This is where language comes in.

Because language is the medium through which we construct and navigate the social world, the social relations and political decisions in which members of Congress participate have no meaning outside their statement in language. In fact, they cannot even be conceived in the absence of language. In order to see that this is also true of statistics, we should begin by examining the relationship between a hypothesis and its corresponding statistic. A hypothesis is a precise statement in language that (1) describes the relevant evidence in empirical reality, which, in turn, implies (2) the statistic that evaluates how well that language describes empirical reality. If we cannot state the hypothesis in language, then we cannot interpret what

it represents in empirical reality. And if we cannot state the evaluating statistic in language, then we cannot link it to the hypothesis and, thus, to a description of empirical reality. We must therefore be able to intertranslate between the hypothesis and the evaluating statistic, establishing a one-to-one correspondence between the relations it describes in empirical reality and the relations evaluated by the statistic.

For example, consider the following hypothesis: "In this jar containing black and white marbles, there are at least twice as many black as white marbles." In evaluating whether or not this statement is accurate, we would count the marbles and calculate their respective proportions of the total. That would be the sense in which the hypothesis implies the statistic (in this case, a very simple mathematical operation). Traveling in the other direction, the statistic implies the form (but not the specific content) of a hypothesis. In this particular example, the statistic (i.e., the calculation of proportions) would be appropriate for all those hypotheses in which counting and proportions were entailed in determining the relation between the hypothetical statement and its manifestation in empirical reality. The point I want to make is that the NOMINATE algorithm does not correspond to the statement of any empirically relevant hypothesis and, thus, cannot evaluate the relation between any hypothetical statement and its manifestation in empirical reality.

The NOMINATE algorithm can certainly be stated in language (including the corresponding mathematical symbols). However, the NOMINATE algorithm does not represent anything in social reality because it does not correspond with an empirically meaningful hypothesis.⁵⁷ In the absence of such a correspondence, NOMINATE can only generate statistical artifacts that have no meaning in social reality.⁵⁸ The problem is not that the sophistication of our language has not caught up with the statistical techniques employed in the construction of the NOMINATE algorithm. The problem is that the NOMINATE algorithm and its several variants have evolved independently of the language we must rely upon to describe and interpret social reality. Our fascination with the statistical artifacts that the algorithm produces has then dragged language in its train,

57. This is perhaps one of the reasons that the statistical artifacts produced by the NOMINATE algorithm are much more frequently used as a descriptive adjunct to interpretive narratives, as opposed to employment as independent or dependent variables. The "look at this" invocation in a descriptive mode evades the impossibility of explaining what it is we are looking at which would inevitably arise if the artifacts were to enter into a hypothetical statement.

58. This is the problem that, in various ways, Bateman and Lapinski, Lee, and Caughey and Schickler have attempted to address. While their critiques of the problem are extraordinarily acute and perceptive, the solutions they recommend only recreate, in each case, the problem in another (albeit more sophisticated) form.

creating terms and notions that have standing only within the social conventions of the attending interpretive community.⁵⁹ Those social conventions, however, merely cloak the fundamental problem: the absence of a correspondence between the algorithm and the social world whose empirical content it purports to represent.

CONCLUSION

All research communities create conventions that become both unacknowledged assumptions and, when displayed in written work, implicit badges of identity. Use of the NOMINATE system thus implies much more than the simple adoption of a new analytical tool because it entails joining a particular research community and acceptance of the assumptions and social conventions which constitute that community. The problem is that these assumptions and their associated lexicon are incompatible with the orientation and conventions that characterize other approaches to historical analysis. As a result, the cost for entry into the NOMINATE community is fairly steep.⁶⁰

The APD research community is certainly not immune from the creation of implicit conventions and assumptions.⁶¹ And these have been deployed as a badge of identity in ways similar to those characterizing the NOMINATE community. However,

APD is far more loosely circumscribed than the NOMINATE community, and for that reason, shared analytical assumptions are more often and effectively interrogated. As a result, the boundaries of the APD community are much more porous and unpoliced. By comparison, the study of Congress (which, as the authors note, has become almost synonymous with the NOMINATE community) is quite closed.⁶²

Every scholar chooses a research community, at least in part, on the basis of the varying social conventions of the research communities that otherwise appeal to them. On the one hand, strong social conventions encourage conformity and discipline, and these things increase the rigor of research. However, as Thomas Kuhn noted long ago, they also impose narrow constraints on the kinds of questions the research community will entertain.⁶³ On the other hand, weak social conventions and the relative absence of conformity and discipline encourage creativity and theoretical diversity. However, these things are also associated with a less commonly shared framework in which theoretical rigor is more difficult to achieve. There is no metric for choosing between these alternatives except personal taste perhaps (but not necessarily) arising from a hunch as to which one will promise the best results. But it is difficult to avoid the conclusion that widespread adoption of the NOMINATE algorithm would radically transform the study of APD.

59. The NOMINATE algorithm has sparked a vigorous and often fruitful debate over the general question of how we might interpret congressional behavior over the course of American history. For this and other things, we should heartily thank Keith Poole and Howard Rosenthal. However, the algorithm itself has now become a bit like *Homo erectus* in the evolution of congressional research. Despite the creative efforts of many supremely talented analysts to devise a viable mutation so that the lineage might continue, it has basically reached a dead end and is now biding time as we wait for the next rung on the evolutionary ladder to appear. From that perspective, the algorithm has become as much an impediment to historical research as it was once a useful tool.

60. Bateman and Lapinski offer similar reasons why APD scholars have generally resisted integration into the NOMINATE community (pp. 149–156).

61. See, for example, Karen Orren and Stephen Skowronek, *Searching for American Political Development* (New York: Cambridge University Press, 2004).

62. Use of the NOMINATE algorithm, for example, is almost universally acknowledged as the preeminent statistical tool in the analysis of legislative behavior. As Bateman and Lapinski note, NOMINATE has “fundamentally transformed the analysis of congressional politics” (p. 147). Caughey and Schickler similarly remark that “no data source has had a greater impact on the study of legislative politics—both historically and in the contemporary period—than the NOMINATE project” (p. 128). Everson et al. are even more effusive in their praise: “anyone interested in understanding current affairs should care about NOMINATE” (p. 98).

63. Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962).