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Teaching Process Tracing: Examples and Exercises

Online Teaching Exercises to accompany David Collier (2011). "Understanding Process Tracing." *PS: Political Science and Politics* 44(4): 823-30.

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Learning and teaching process tracing is an important goal, both for qualitative researchers and for scholars who wish to supplement other methodologies with insights from within-case analysis. The examples and exercises presented here seek to advance this goal.

Process tracing is the systematic examination of diagnostic pieces of evidence, typically viewed in a chronological sequence, with the objective of evaluating hypotheses formulated by the investigator. This method has been developed in a series of studies, above all by Alexander George and Andrew Bennett, which explicate and refine the technique.¹

Ironically, as Zaks (2011) has pointed out, although process tracing now receives substantial attention as a research procedure, the substantive studies evoked by methodologists to illustrate process tracing typically do not identify this as their method. These studies, correspondingly, do not use the diagnostic tests commonly discussed in methodological statements on this approach. Hence, both for researchers who wish to strengthen their substantive work through explicit use of process tracing, as well as for methodologists interested in new approaches to within-case analysis, the wider diffusion of this method is much needed.

The examples and exercises presented here are intended to accompany "Understanding Process Tracing" (Collier 2011) and are cross-referenced to that article. The examples span the fields of American politics, international relations, comparative politics, and public health, as well as detective fiction: a Sherlock Holmes mystery story. In the framework of the Collier article, good description and careful causal inference are both central to process tracing. The examples address both of these challenges, and the exercises are grouped according to whether they focus on description or causal assessment.

Among these substantive examples, only Bennett's (2010) analysis of international relations explicitly uses the language of process tracing. This reflects Zaks's point: much research that can be treated as process tracing does not explicitly state that this is the method used. However, two examples apart from Bennett—Brady and Freedman—adopt the language of causal-process observations, which are seen here as a basic building block of process tracing (Collier 2011, 823).

Four additional points should be underscored about these exercises. First, the appropriate set of examples and questions will depend on participants' substantive interests and background knowledge. For instance, the Bennett and Freedman readings each cover several examples, and it may be productive to focus on only one or two from each author. Also, some questions refer to alternative types of background knowledge. Answering such questions may require familiarity with the wider literature of which the example is a part, and these questions might be skipped by those not familiar with the relevant literature.

Second, among the exercises, several focus on journal articles, allowing easy online access through college and university libraries. Others are readily available as chapters in Brady and Collier (2010). For the studies by Lerner, Tannenwald, Fenno, and Skocpol et al., an expanded form of the argument is available as a book. Although the questions on these authors are designed to be answered with the articles, certain questions can be answered more fully, based on the books.

Third, in doing the exercises, one sometimes must deal with ambiguities in the specification of hypotheses, the assumptions that undergird the analysis, and the interpretation of tests. Of course, such ambiguities can be challenges with any research method, including statistical analysis, and they remind us that quantitative and qualitative research are both hard to do well (Brady, Collier, and Seawright 2010, 22). These ambiguities in process tracing are discussed

briefly by Collier (2011, 825–27 and tables 4 and 5), who illustrates alternative interpretations of evidence that result from different assumptions adopted by the researcher.

Fourth, Zaks (2011) has introduced a major innovation in process tracing that is applied in some of the exercises. She demonstrates that adequate interpretation of tests must consider the specific relationship between the main hypothesis and the rival hypothesis of central concern. These two hypotheses may be *mutually exclusive*: acceptance of one entails rejection of the other—yielding a strong test. Alternatively, they may be *coincident*: they work independently of one another in producing the outcome—which means that affirming one is not a test of the other. Finally, they may be *congruent*: they interact and jointly produce the outcome. Here again, a given test may make a much weaker contribution to rejecting the rival hypothesis.

As with the challenge of specifying the statistical model in quantitative research, in process tracing placing the hypotheses in one of Zaks's three categories depends on assumptions and background knowledge. Yet compared to statistical analysis, process tracing can have the advantage that the investigator has close insight into specific cases—potentially making it easier to arrive at plausible and appropriate assumptions.

Zaks's distinctions should be treated as a supplement to the norms about the strength of tests summarized in Collier's (2011) table 1. At certain points in the exercises, these distinctions are explicitly noted in the questions; at other points, readers may find it productive to introduce them in their responses.

Descriptive Inference²

Although process tracing typically involves the causal analysis of processes that unfold over time, this analysis fails if it is not founded on careful description. Hence, good description of what in a sense are static, cross-sectional slices of reality is a crucial building block for process tracing.

EXERCISE 1. LERNER ON A TURKISH VILLAGE

Lerner, Daniel. 1958. "The Grocer and the Chief: A Parable." Chapter 1 in Lerner, *The Passing of Traditional Society: Modernizing the Middle East*. New York: The Free Press, 1958. Although it is not required for the exercises, a fuller examination of Lerner's entire book will provide further insight into the goals and methods of chapter 1.

Introduction. Lerner's case study is the first chapter in his book, *The Passing of Traditional Society*,³ which analyzes social and economic change in the Middle East, using a large cross-national opinion survey.⁴ Lerner's chapter presents a microcosm of these wider processes of change by examining the dramatic "modernization" in a Turkish village between 1950 and 1954. This transformation results from the election of a new national governing party and the subsequent introduction of infrastructure that includes electricity and a modern road to Ankara. The rapid change in the village is thus the dependent variable, and the author's goal is to tease out what modernization means in this context. The chapter includes dozens of specific observations of people, social interactions, and material conditions that provide remarkable insight into this dependent variable. Lerner's study not only illustrates the kind of descriptive inference needed in process tracing, but more broadly the chapter gives readers excellent practice in examining and evaluating fine-grained evidence.⁵

Questions on Lerner

1. Observations, Overarching Concepts, and Change over Time.

1a. Make an inventory of the observations that are woven into this case study. Your inventory should include information about social attributes and interactions; demographic characteristics; and material objects, physical infrastructure, and commercial establishments. You should be able to find a large number of these observations.

1b. Organize the inventory by identifying a smaller number of overarching concepts, for which these numerous observations serve as specific indicators, and use these concepts to group the observations. For example, one such concept could be occupation.

1c. Information is reported for both 1950 and 1954. Note carefully which observations for 1954 reflect change over time.

2. Empathic Personality. A key concept in Lerner's book is the empathic personality, involving "empathic capacity," a characteristic of individuals who have a strong ability to imagine themselves in different life situations than their own.⁶ Lerner contrasts this with the "constrictive personality" (49–51). Based on the answers to Question 1, identify evidence about empathic versus constrictive personalities. Does the evidence point to change between 1950 and 1954?

3. Metaphors for Change. In Lerner's analysis, the grocer, the chief, and the chief's sons are in part a metaphor for change. Discuss this metaphor and analyze the wider transformations it reflects.

4. Theoretical Background. Lerner presents his evidence in a way that makes his analysis appear strongly inductive, yet modernization theory in fact guides his decisions to focus on certain kinds of evidence. Characterize the prior knowledge he brings to this study. (The answer requires some knowledge of modernization theory.)

5. Transition to a Large-N Data Set. Some of the information presented in Lerner's chapter—for example, demographic data—is quantitative, and other data may be aggregated into quantitative variables. In the spirit of pursuing multimethod research, consider which observations and variables are quantitative or might be treated as quantitative. Identify aspects of change analyzed in the article for which this shift is easy and appropriate, and those which do not lend themselves to quantitative analysis.

EXERCISE 2. FENNO ON MEMBERS OF CONGRESS

Fenno, Richard. 1977. "U.S. House Members in Their Constituencies: An Exploration." *American Political Science Review* 71 (3): 883–917. Fenno's research is also reported in Fenno 1978, 2000, 2003, 2007. More elaborate answers for this exercise could also draw on these sources, but need not do so.

Introduction. Fenno's research is highly regarded for its rich description of how members of Congress interact with their constituents. His 1977 article describes what he calls members' "home style," that is, their perceptions of constituents and their activities in representing them. This description is then used in Fenno's other studies that seek to explain patterns of representation in the House. By focusing on home districts, rather than on Washington, DC, Fenno makes a major contribution to the field of American politics. His method is close observation of House members, which he calls "soaking and poking," or "just hanging around." This article reports the dimensions and categories that Fenno derives for describing representation, based on this method.

Questions on Fenno

1. Representational Styles and Types of Constituencies. Fenno describes three dimensions of representation and four types of constituencies.

1a. As a baseline for the rest of the discussion, summarize these dimensions and types in approximately one sentence each—including the idea of concentric constituencies.

1b. Make an inventory of the evidence Fenno uses to identify and characterize each of these dimensions and types.

1c. Discuss whether any of these dimensions or types are especially well measured by Fenno's observations—or poorly measured. For the instances of less adequate measurement, suggest additional data that might help address this problem.

2. Soaking and Poking.

2a. Discuss concretely what Fenno does when he is soaking and poking. Whom does he talk to? How does he get good access and establish his credibility with interviewees? What additional data sources does he use?

2b. Concept formation is a foundation of good description. Explain how Fenno generates the dimensions and categories he uses.

2c. Summarize what Fenno says about his sampling strategy (884). Are you satisfied with this strategy? Is it appropriate for exploratory research? You might consider Fenno's discussion in light of Tansey's (2007) argument about strategies of case selection in process-tracing research.

3. Fenno's Wider Contribution.

3a. Discuss Fenno's view of the leverage provided by in-depth interviews. Note that, in addition to his 1977 *APSR* article (the focus of this exercise), Fenno offers a further perspective on this question in Fenno (1986), which is readily accessible online.

3b. It might be claimed that Fenno's research does not add much to classic rational choice models of legislative behavior. These models might hold that representatives make multi-faceted calculations of advantage within the legislative arena; yet they are single-minded reelection seekers vis-à-vis their constituencies—because they know “where the rewards are” (Denzau, Riker, and Shepsle 1985, 1118). By contrast, Aldrich and Shepsle (2000) maintain that Fenno's soak-and-poke methodology is a necessary complement to rational choice theories of political action because it provides a way of understanding behaviors that rational choice models would otherwise treat as anomalous. Based on Fenno's article, provide one or more examples of House members' behavior that is anomalous or under-theorized by rational-choice theory—given that this theory views representatives as single-minded reelection seekers.

3c. Consider whether Fenno's descriptive work suggests hypotheses that might explain variations in the following: (i) level of expenditure on home district offices and staff; (ii) time spent in the home district; (iii) issue-oriented versus person-to-person self-presentation to constituents; (iv) effort to explain Washington activity to constituents. If it does suggest such hypotheses, list one or more of them.

EXERCISE 3. TANNENWALD ON THE NUCLEAR TABOO

Tannenwald, Nina. 1999. “The Nuclear Taboo: The United States and the Normative Basis of Nuclear Non-Use.” *International Organization* 53 (3): 433–68. For a book-length treatment of this topic, see Tannenwald 2007.

Introduction. Tannenwald analyzes the use versus non-use of nuclear weapons by the United States in four historical episodes: the end of World War II, when these weapons were used, and the Korean, Vietnam, and First Gulf Wars, when they were not used. Tannenwald's central concern is with a “normative” explanation: the existence of an ethical “nuclear taboo,” which she understands as “a particularly forceful kind of normative prohibition” for policy-makers. The existence or non-existence of this taboo is hypothesized to explain the (analytically distinct) outcome of the actual use or non-use of nuclear weapons. Tannenwald's study provides an excellent basis for an exercise because she makes extensive use of process tracing to establish in descriptive terms the existence/non-existence of this taboo across the four wars. Her study is quite different from Lerner's, in that she also devotes extended attention to formulating and testing rival explanations. The discussion of Tannenwald therefore serves as a bridge between the exercises that focus on descriptive inference and those that address causal inference.

Questions on Tannenwald

1. Describing the Taboo.

1a. Make an inventory of the observations used by Tannenwald to establish the existence/non-existence of the taboo.

1b. Tannenwald uses diverse types of sources and reports. List these and group the corresponding observations under each.

1c. Evidence about the existence of the taboo comes not only from statements by policy-makers who supported it, but also from individuals who opposed and objected to it. Consider this second type of evidence. Does it increase the plausibility of Tannenwald's argument?

2. Rival Explanations. Alternative hypotheses are crucial in Tannenwald's analysis.

2a. Summarize the hypothesized explanations that she considers.

2b. Discuss which hypotheses are derived from international relations theory, as opposed other lines of analysis. What prior knowledge goes into constructing these hypotheses? (A detailed answer will require some knowledge of international relations theory. Question 2b might therefore be skipped in some contexts.)

2c. Comment on the evidence provided for evaluating these rival explanations.

2d. Tannenwald underscores the possibility of reciprocal causation between the nuclear taboo and rival explanatory factors—for example, the interaction among the taboo, the lack of preparedness for tactical nuclear warfare, and debates on the availability of suitable targets. Review the evidence she uses in addressing this issue.

2e. Based on Zaks's framework, evaluate whether these rival hypotheses are mutually exclusive vis-à-vis her main hypothesis about the nuclear taboo. Alternatively, are they coincident or congruent?

3. Comparing the Wars. Consider differences among the Korean, Vietnam, and the First Gulf War in the kind of evidence available and the inferences made. Is there better data for any one or two of the wars? Does the taboo take a distinct form at different points in time?

4. Criticism and Debate. Evaluate the sharp disagreement between Beck (2010), as opposed to Collier, Brady, and Seawright (2010), over the viability of Tannenwald's analysis. For example, Beck (2010) dismisses Tannenwald's study, given his skepticism about using as evidence the statements made by policy-makers to account for their decisions. Regarding policy-makers, Beck argues that

...sometimes they tell stories we like, and we are happy, and sometimes not. So a study of what policy-makers said about why they did not want to use nuclear weapons is clearly interesting, but it is a different study from (the impossible one) of the causes of the US using or not using nuclear weapons after World War II. (Beck 2010, 502)

Thus, Beck not only rejects Tannenwald's process-tracing methodology, but he claims it is impossible to study what was certainly one of the most important issues of international politics in the Cold War Era. Apparently it is impossible because for Korea, Vietnam, and the First Gulf War, there is no variance on the dependent variable (Beck 2010, 502).

Assess Beck's position. Among other things, his challenge suggests the value of scrutinizing Tannenwald's sources of evidence. How reliable are these sources? Your answer might draw on the crucial issue raised in Question 1c, as well as by Collier, Brady, and Seawright (2010, 509), who strongly dissent from Beck's evaluation of Tannenwald.

Causal Inference

Causal inference is the more familiar focus of process tracing—involving assessment of explanatory hypotheses on the basis of carefully selected pieces of diagnostic evidence. As already emphasized, adequately assessing hypotheses must build on a foundation of good description. Yet the central focus in standard discussions of process tracing is on causal inference.

EXERCISE 4. BRADY ON THE 2000 US PRESIDENTIAL ELECTION

Brady, Henry E. 2010. "Data-Set Observations versus Causal-Process Observations: The 2000 U.S. Presidential Election." In Henry E. Brady and David Collier, eds., *Rethinking Social Inquiry*, 2nd ed. Lanham, MD: Rowman and Littlefield.

Introduction. Brady's chapter debates the findings of John Lott, who uses regression analysis to claim that in the 2000 presidential election in Florida, the early and incorrect media call in favor of Gore suppressed the Bush vote in the Florida Panhandle. The Panhandle is on Central Time, and Lott argues that the media call discouraged Bush supporters from voting in the period just before the polls closed, and that Bush therefore lost at least 10,000 votes. Brady disagrees, using process tracing⁷ to demonstrate that the early media call had virtually no effect in suppressing the vote for Bush.

Questions on Brady

1. The Basic Arguments. Summarize the arguments advanced by Lott and by Brady in evaluating the voting outcome in the Florida Panhandle.

2. Relationship between the Arguments. Evaluate, based on Zaks's (2011) framework, whether Lott's and Brady's hypotheses are mutually exclusive, given that Brady's argument could be seen as simply the null hypothesis vis-à-vis Lott's claims. Alternatively, is the relationship between the two arguments more complex?

3. Inventory of Tests. Make an inventory of the process-tracing tests employed by Brady, following the format of tables 3 to 7 in Collier (2011) that enumerate the hypothesis, clue, inference, and summary of the test.

4. Types of Tests. Locate these tests within the typology in Collier's table 1 and in the causal sequence framework of independent, intervening, and dependent variables—and auxiliary outcomes (Collier 2011, 825–26, 828).

5. Prior Knowledge. Brady draws on prior studies of voting behavior in the United States to establish diagnostic criteria for evaluating his argument. Evaluate this prior knowledge.

6. Process Tracing with Quantitative Data. Brady's tests are based on large-N, quantitative data. Discuss why Brady nonetheless presents this as an example of process tracing, a method typically associated with qualitative analysis.

7. Least-Likely Case. Brady suggests (242) that his study—based as it is on large-N, quantitative electoral data—is a "least-likely case" for demonstrating the relevance of the qualitative reasoning associated with process tracing.⁸ Due to the extensive quantitative data available, one might expect that these qualitative tools would not be relevant. Brady argues that they *are* relevant, and that this example therefore provides a particularly strong demonstration that these research procedures are important. Discuss this argument. Do you agree, or disagree? Why?

8. Extending the Study. Brady states (241) that if he were to pursue the analysis further, he would seek additional process-tracing evidence, rather than developing a quantitative data set, even though he is analyzing mass political behavior. Evaluate whether this is an appropriate strategy. Why or why not?

EXERCISE 5. SKOCPOL ET AL. ON US CIVIC ASSOCIATIONS

Skocpol, Theda, Marshall Ganz, and Ziad Munson. 2000. "A Nation of Organizers: The Institutional Origins of Civic Voluntarism in the United States." *American Political Science Review* 94 (3): 527–46. For a book-length treatment of this topic, see Skocpol 2003.

Introduction. Many scholars have viewed the emergence of civic associations in the United States during the 19th century as strongly grounded in local communities. Both the push to create civic associations and the activities of these associations are seen as centered in small jurisdictional units, ranging from urban centers to small hamlets. What might be termed the "localist" thesis thus posits that (i) large trans-local voluntary associations have not been a widespread or durable part of civil society in the United States; and further, (ii) the creation of trans-local organizations, when it did occur, was usually preceded by a substantial phase of localist organizing. In challenging this thesis, Skocpol and her collaborators seek to demonstrate that between 1890 and 1940, a major part of the initiative for organizing civic associations took place at the trans-local level. Even when the associations were initially organized at the local level, associations at the state and national level played a critical role in subsequent organizing efforts, and in particular were crucial in leading additional organizing at the local level. Furthermore, associations tended to have a national-state-local structure, and the authors aim to explain why. They hypothesize that the federated structure adopted by associations is explained by the institutional design of the American state. Because state capacity was present at all three levels of the federal polity, groups used this "well-understood, already legitimate" structure to attract

members and win allies (533). To test these descriptive and explanatory hypotheses, the authors assemble an impressive array of both quantitative and qualitative archival evidence.

Questions on Skocpol et al.

1. Descriptive Claims.

- 1a. State Skocpol et al.'s descriptive claims regarding the character and origin of US civic associations.
- 1b. Identify the evidence used by the authors to evaluate these claims.

2. Explanatory Claims.

- 2a. Summarize the explanatory claims made by Skocpol et al.
- 2b. Describe the tests employed by the authors. Do these tests fit into the cells of table 1 in Collier (2011)?
- 2c. Overall, evaluate the authors' assessment of rival hypotheses. Do you find their treatment convincing?

3. Prior Knowledge.

- 3a. Discuss the prior knowledge Skocpol et al. use to generate concepts, hypotheses, and diagnostic criteria. This prior knowledge may include previously published theoretical work, as well as empirical evidence from earlier studies.
- 3b. Evaluate the use of prior knowledge in this study. Might it be improved?
- 3c. The localist thesis has been strongly embraced by a number of scholars, many cited in this article. Identify the critiques they might have of Skocpol et al.'s (i) review of prior knowledge, (ii) formation of hypotheses, (iii) diagnostic criteria, and (iv) presentation of evidence.
- 3d. Consider whether normative theories of democracy in the United States are part of the prior knowledge that guides Skocpol et al.'s analysis. This might include, for instance, the idea that small, local associations are more (or less) likely to generate virtuous forms of civic engagement. Are these normative theories relevant in establishing the authors' empirical expectations, for example, that national, federated civic organizations were part of the organizational landscape in the late 19th and early 20th centuries?

4. Which Kinds of Associations Persist? Skocpol et al. argue that a key feature of multitiered civic associations was their greater durability in the late 19th and early 20th centuries, compared to nonfederated groups. Discuss the implication of this finding for the comparison in the authors' table 3, which shows that early in the 20th century, the federated associations were three-and-a-half times more numerous than those that were nonfederated. To the extent that the analysis is focused on the emergence of associations, is it possible that—given their shorter persistence—the proportion of nonfederated associations at the later point in time underrepresents their relative importance at the time of origin? Thus, for the purpose of Skocpol et al.'s analysis of the groups' emergence, do the authors risk undercounting the nonfederated associations? Does the analysis take this potential undercounting into consideration? If so, how? If not, how might this be accomplished?

EXERCISE 6. WEAVER ON PUNITIVE CRIME POLICY IN THE UNITED STATES

Weaver, Vesla M. 2007. "Frontlash: Race and the Development of Punitive Crime Policy." *Studies in American Political Development* 21 (2): 230–65.

Introduction. Vesla Weaver's study addresses an important puzzle in the evolution of U.S. crime policy in the 1960s. Overall, this might be thought of as a progressive period: the Johnson Administration's Great Society programs to mitigate poverty; the remarkable gains in equal protection and equality that derived from the civil rights movement, the Civil Rights Act, and the Voting Rights Act; and Supreme Court rulings that expanded the rights of defendants in legal cases. Yet this same period saw the introduction of major new punitive initiatives in crime policy, such as mandatory minimum sentencing and provisions for trying juveniles as adults. The longer-term consequences of the new policies would prove dramatic. For example, between 1973 and 2000, the total US prison population increased more than six-fold. Given the progressive context of the 1960s, how does one explain this major shift in crime policy? Was there in fact a dialectical relationship between the progressive and punitive facets of US policy? Weaver takes on these questions through a sophisticated analysis focused on what she calls "frontlash," that is, agenda-setting by a conservative coalition that preemptively shifts its attention to crime policy after suffering defeats in other policy domains.

Questions on Weaver

1. Hypotheses. Weaver offers three hypotheses about the evolution of crime policy in the United States: backlash, frontlash, and (secondarily) crime-was-not-the-cause.

- 1a. Summarize these hypotheses. Note that the first two—above all, frontlash—are complex, multistep arguments. Be sure to capture this in your summary.
- 1b. Discuss whether the racialization-of-crime argument is an additional hypothesis. Is it an intervening variable through which frontlash crystallized? Alternatively, is it best understood simply as a component of this process?
- 1c. Try to identify rival explanations to account for the change in crime policy, using the information offered by Weaver or other information you can locate.

2. Description. Adequate testing of these hypotheses must rest on careful description.

- 2a. Weaver's study argues that crime policy became more punitive during the 1960s. Review her evidence. Using the information she provides (and other sources if you wish), consider policy change at both the federal level and state level.
- 2b. Evaluate how adequately the frontlash and backlash hypotheses are conceptualized and operationalized.
- 2c. Discuss the evidence Weaver offers for the racialization of crime policy and the criminalization of racial struggle. Is it convincing?

3. Testing the Hypotheses.

- 3a. Identify the diagnostic evidence Weaver offers to test her frontlash hypothesis. The following list may provide guidance in pinpointing relevant steps.
 - (i) Prior policy battles lost by the conservative coalition.
 - (ii) The decision to shift the venue of conflict.

- (iii) Preemptive formulation of a new agenda for crime policy.
- (iv) Focusing events.
- (v) Extension of concern about the initial focusing events—crime and riots—to concern about the civil rights movement.
- (vi) Role of public opinion.
- (vii) Strategic pursuit.
- (viii) Racialization of crime.
- 3b. Consider whether the diagnostic evidence you identify in question 3a is sufficient to affirm the frontlash hypothesis.
- 3c. The crime-was-not-the-cause hypothesis posits that changes in crime policy are not explained by crime rates. Describe how that hypothesis relates to the backlash and frontlash hypotheses. Because the urban riots of the late 1960s involved widespread destruction of property and criminal violence, can it be concluded that this invalidates the crime-was-not-a-cause hypothesis, given that policy change occurred? Are other aspects of crime relevant here?
- 3d. Indicate where you would place Weaver's tests in Collier's (2011) table 1.
- 3e. State, overall, if are you satisfied with Weaver's assessment of rival hypotheses.

EXERCISE 7. BENNETT ON THE FASHODA CRISIS, WORLD WAR I, AND CENTRAL EUROPE IN 1989

Bennett, Andrew. 2010. "Process Tracing and Causal Inference." In Henry E. Brady and David Collier, eds., *Rethinking Social Inquiry*, 2nd ed. Lanham, MD: Rowman and Littlefield.

Introduction. Bennett illustrates the use of process tracing in causal inference, focusing on explanatory puzzles in international relations and drawing on the highly developed body of prior theory found in that subfield. He focuses on three singular events: the 1898 Fashoda crisis, the transformation of German military strategy during World War I, and the Soviet Union's nonintervention in Eastern Europe in 1989. He indicates explicitly which process-tracing test (see his table 1) is applied at each step, and he focuses especially on hoop tests. As you examine his argument, be alert to whether each test is well matched to the hypothesis being tested.

Questions on Bennett

1. **Prior Knowledge.**
 - 1a. Identify the areas of international relations theory on which Bennett builds his analysis. A brief answer may draw on ideas in his article. A more elaborate answer requires wider knowledge of the international relations literature.
 - 1b. Summarize the link between this prior knowledge and the specific hypotheses he formulates.
 - 1c. State how this prior knowledge guides the selection of diagnostic evidence for testing the hypotheses.
2. **Summarizing the Tests.** Bennett presents numerous hoop tests, one straw-in-the-wind test, and two smoking-gun tests. Describe at least four of these tests. Follow the format in Collier's (2011) tables 3 to 7 for listing the hypothesis, clue, inference, and summary of the test.
3. **Relationship among Rival Hypotheses.** International relations theory suggests various hypotheses to explain the outcomes analyzed by Bennett. Consider whether Zaks's framework for evaluating the relationship among these hypotheses is useful here. Give specific examples.

4. **Scrutinizing the Tests.** Discuss whether Bennett's classification of the tests presented in his study should possibly be amended. That is, are they correctly identified as hoop, straw-in-the-wind, or smoking-gun tests?

5. **Causal Sequence Framework.** Evaluate which of Bennett's process-tracing tests focuses on independent, versus intervening, versus dependent variables, or a combination of these. Is it helpful to make these distinctions?

6. **Criteria for Identifying Diagnostic Evidence.** Summarize whether Bennett's criteria for identifying diagnostic evidence derives from international relations theory, as opposed to other frameworks or theories. Thus, what specific forms of prior knowledge does Bennett bring to this analysis? (A brief answer could rely on Bennett's article. A more complete answer would draw on wider knowledge of international relations theory.)

7. **Convincing?** Given available evidence and the specific hypothesis being evaluated, which of Bennett's tests are most convincing, and which least convincing? Explain this contrast.

EXERCISE 8. SCHULTZ ON DEMOCRACY AND COERCIVE DIPLOMACY

Schultz, Kenneth A. 2001. *Democracy and Coercive Diplomacy*. New York: Cambridge University Press, 175–96 only.

Introduction. This section of Schultz's 2001 book is the principal source used in Bennett's (2010) brief analysis of the Fashoda crisis of 1898. In this crisis, Britain and France resolved their competing imperial claims to the Upper Nile Valley without resorting to the use of force. This event presents a valuable opportunity for testing the mechanisms underlying the interdemocratic peace hypothesis that democracies do not go to war with one another.

Questions on Schultz

1. **Schultz versus Bennett.**
 - 1a. Assess whether Schultz and Bennett draw on basically the same body of theory and prior knowledge.
 - 1b. Discuss whether Schultz, based on a far more detailed analysis, reaches the same or different conclusions from Bennett. Does his analysis cast any of Bennett's tests in a different light? Does Schultz offer tests not used by Bennett?
2. **Two Levels of Generality.** Schultz addresses explanations of the Fashoda crisis at two levels: (i) broad theoretical approaches—for example, neorealism and the theory of democratic peace; and (ii) specific hypotheses derived in part from these theories and in part from elsewhere. Consider the different forms of prior knowledge involved at these two levels.
3. **Evaluating Arguments.** Assess how arguments from these two levels are evaluated through process tracing. What findings emerge?
4. **Lack of Wars between Democracies.** An early explanation offered for the lack of wars between democracies was that democratic publics will not be belligerent because they do not want to impose the costs of a war on themselves.

4a. Identify Schultz's evidence for testing this hypothesis. How is process tracing used to assess this evidence, and what is the outcome of the test?

4b. Compare (i) the central tenets and predictions of the democratic peace thesis with (ii) Schultz's "confirmatory effect," which focuses on the transparency of domestic political processes in democracies.

5. Exceptions to Schultz's Argument. Later in the book Schultz notes cases that do not fit his theory, for example World War I and World War II (e.g., 144–46), and he offers a brief comment on explaining these exceptions. Formulate this comment as a hypothesis, and suggest how process-tracing tests might evaluate it. Can you suggest other hypotheses about these exceptions, as well as how they might be tested? (Note that this final question broadens the focus beyond the section of the book that analyzes the Fashoda crisis.)

EXERCISE 9. FREEDMAN ON BREAKTHROUGHS IN EPIDEMIOLOGY

Freedman, David A. 2010. "On Types of Scientific Inquiry: The Role of Qualitative Reasoning." In Henry E. Brady and David Collier, eds., *Rethinking Social Inquiry*, 2nd ed. Lanham, MD: Rowman and Littlefield.

Introduction. Freedman argues that qualitative evidence played a crucial role in major, historical innovations in epidemiology. These innovations, in addition to their importance for public policy, are also relevant models for political science methodology. Freedman examines six breakthroughs: discovering smallpox vaccine and penicillin, and establishing the causes of cholera, pellagra, beriberi, and puerperal/childbed fever. Freedman's goal is to demonstrate that, in each case, qualitative evidence made a crucial contribution; qualitative and quantitative analysis worked together; and this qualitative analysis is so important as to be a "type of scientific inquiry" in its own right.

Questions on Freedman

1. Prior Theory. For these breakthroughs in research, discuss the state of prior theory—or perhaps more modestly, the commonly held prior hypotheses. How did these hypotheses focus the search for evidence? The role of a prior hypothesis is clear in John Snow's study of cholera. Compare Snow's analysis in this regard to some of the other studies discussed by Freedman.

2. Inventory of Tests. Give examples of the process-tracing tests (i.e., straw-in-the-wind, hoop, etc.) that play a key role in the studies examined by Freedman. As appropriate, follow the format of Collier's (2011) tables 3 to 7 by identifying the hypothesis, clue, and inference, and providing a summary of the tests.

3. Specific Contribution of Qualitative Evidence. Freedman (232) argues that in his examples, qualitative evidence contributes to three tasks: "refuting conventional ideas if they are wrong, developing new ideas that are better, and testing the new ideas as well as the old ones." Review how key pieces of diagnostic evidence from Freedman's case studies contribute to one or more of these tasks.

4. Exemplar: Snow's Cholera Study. Reread in Freedman's chapter the discussion of Snow on cholera, and also examine closely the discussion of Snow in Dunning (2010), including the placement of

Snow in Dunning's figures 14.1, 14.2, and 14.3. Both Freedman and Dunning underscore the importance of integrating qualitative and quantitative evidence.

4a. Summarize how both qualitative and quantitative evidence are important in Snow's study.

4b. Identify the implications for multimethod research that can be drawn from this example.

5. Is Snow on Cholera, Like Brady on the 2000 Election, a Least-Likely Case?

5a. As noted above, Brady argues that his analysis of the 2000 presidential election—given that it is based on large-N, quantitative data—is a least-likely case for showing the importance of qualitative evidence and reasoning. He sees his analysis as a particularly telling demonstration that this method is indeed valuable. In parallel, consider the argument that because qualitative evidence and reasoning are likewise important in Snow's quantitative analysis of 10,000 households, it also makes Freedman's example a least-likely case that provides especially strong support for the claim that systematic qualitative analysis is important.

EXERCISE 10. ROGOWSKI ON STRONG THEORY

Rogowski, Ronald. 2010. "How Inference in the Social (but Not the Physical) Sciences Neglects Theoretical Anomaly." In Henry E. Brady and David Collier, eds., *Rethinking Social Inquiry*, 2nd ed. Lanham, MD: Rowman and Littlefield.

Introduction. Rogowski underscores the perspective emphasized throughout the exercises—the concern with prior theoretical expectations and how they can sharpen the focus on specific diagnostic evidence that moves the analysis forward. In his examples, the studies that overturn major prior hypotheses are Lijphart's analysis of the Netherlands, Allen's case study on the rise of Nazism, Gourevitch's critique of claims about the role of core states advanced by world systems theory, Katzenstein's investigation of small states in world markets, and Bates's examination of failed economic growth in Africa. Like Freedman (2011, 233 and passim), Rogowski emphasizes the value of looking for anomalies that may come into focus because rival explanations are carefully formulated.

Questions on Rogowski

1. Strong Theory.

1a. Identify the bodies of prior knowledge that frame the studies Rogowski considers.

2. Overturning Arguments with a Single Observation.

2a. According to Rogowski, if the researcher uses strong theory that yields precise predictions, then observations from a single case can decisively overturn a prior line of argument. Summarize your assessment of whether, given the information Rogowski provides, you are as convinced as he is that these studies justify such strong conclusions.

2b. Zaks (2011) argues that particularly strong tests of hypotheses are possible if the hypotheses are mutually exclusive, rather than coincident or congruent. Discuss whether, in Rogowski's examples, the tests are strong specifically because the hypotheses are mutually exclusive. Thus, might the tests he considers be decisive due not only to strong theory, but because the theory specifies a particular type of hypothesis? If this is true, how does it affect Rogowski's overall argument?

3. Eddington's Test of Einstein's Theory. Rogowski discusses the famous 1919 test of Einstein's Theory of Relativity. Based on celestial observations made from Brazil and West Africa, Eddington found that the magnitude of deflection of light from stars during a solar eclipse corresponded to the theory's prediction. This observational (not experimental) study played an important role in the wide acceptance of Einstein's theory.⁹

3a. Evaluate whether this test is a case study, a quantitative analysis, or both.

3b. Consider whether this physical science example is helpful in bolstering Rogowski's argument.

4. Contribution of Case Studies. Rogowski summarizes King, Keohane, and Verba's (1994, hereafter KKV) bruising critique of case studies, a critique to which he takes strong exception. Rogowski observes:

KKV contends that "in general...the single observation is not a useful technique for testing hypotheses or theories" [quoted from KKV, p. 211], chiefly because measurement error may yield a false negative, omitted variables may yield an unpredicted result, or social-scientific theories are insufficiently precise. (Rogowski 2010, 93)

Rogowski (93) pointedly concludes that KKV are thereby arguing that these studies by Lijphart, Allen, and Gourevitch are "bad science."

4a. Evaluate KKV's position. Note their implicit premise that *quantitative* studies can, in fact, avoid these flaws. Juxtapose this premise with, for example, Bartels's (2010) view of measurement error in quantitative research and Seawright's (2010) discussion of problems such as omitted variables in regression studies. What balance would you strike?

EXERCISE 11. SHERLOCK HOLMES: A MASTER OF PROCESS TRACING?

Conan Doyle, Arthur. "The Adventure of Silver Blaze." Originally published in *Strand Magazine* Vol. 4 (December 24, 1892): 645–60. In Doyle (1960) it is on pp 335–50. A searchable copy of the story accompanies this set of exercises.

Introduction. The Sherlock Holmes story "Silver Blaze" is rich in examples of process-tracing. A number have been closely examined by Collier (2011), but many others also merit attention. Collier's discussion focuses primarily on explaining Straker's murder, but explaining the disappearance and whereabouts of the horse is also an important puzzle.

Questions on Sherlock Holmes

1. Hypotheses, Clues, and Inferences.

1a. Tables 3 to 7 in Collier (2011) present a partial inventory of hypotheses, clues, and inferences in the "Silver Blaze" story. Examine these tables and the corresponding parts of the story, and evaluate Collier's analysis. Might you have formulated any of the hypotheses in a distinct way, selected different clues, and/or made different inferences?

1b. Prepare an inventory of further examples, in addition to those in Collier's tables 3 to 7, following the same format as his tables. You may wish to focus on explaining either Straker's murder or the disappearance of the horse.

2. What Kinds of Prior Knowledge? In dozens of Sherlock Holmes stories, the detective draws on a remarkable range of prior knowledge. In this particular story, for example, he uses knowledge of the receipts that people are likely to carry in their pockets, the sociability of horses, the behavior of dogs, the characteristics of surgical knives, the actions of race horse owners who are prone to cheat, and the defensive tactics of Gypsies. Identify additional pieces of general information that Holmes utilizes in "Silver Blaze." Where does this information fit in the four categories of background knowledge discussed by Collier (2011, 833)?

3. Holmes as a Master of Process Tracing? Discuss other details in the story that give insight into Holmes's reasoning. Consider how the prior knowledge discussed in Question 2 helps him arrive at his insights. Relatedly, does the information provided in the narrative reveal the sequence in which he gains these insights?

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Maria Gould and Philip Rocco provided valuable assistance in preparing these exercises.

NOTES

- Collier (2011, note 3) cites the substantial literature that has discussed and developed this method.
- To underscore an obvious but crucial point: It is productive to refer to descriptive inference, and not just description, given the challenge of moving from particular pieces of data to the wider concept that one wishes to "describe." In the Tannenwald study below, for example, adequately describing the nuclear taboo that she posits requires complex inferences from particular items of information to the broader idea.
- For a caveat regarding Lerner's study, see Collier 2011, note 12.
- Drawing on a larger data set, the book focuses on 1,600 respondents in six Middle Eastern countries.
- As noted, analysis of this village is embedded in a large-N survey, and Lerner's study is therefore not, overall, based on process tracing. Rather, the point here is that examining Lerner's highly detailed information on the village provides excellent practice for the descriptive component of process tracing. The same could be said about the Fenno example. In Fenno's other studies, the insights drawn out of "soaking and poking" are analyzed in diverse ways other than process tracing.
- As Lerner puts it, "to simplify the matter," this is "the capacity to see oneself in the other fellow's situation." It involves "a high capacity for rearranging the self-system on short notice" (50, 51).
- Like Freedman in the exercise below, Brady organizes his discussion around the idea of causal-process observations (CPOs). As already noted, CPOs are a foundation of process tracing. Brady's analysis (and also Freedman's) is therefore treated here as an illustration of that method.
- Eckstein (1975, 113–23) provides a benchmark discussion of crucial-case analysis and specifically least-likely cases.
- See, for example, note 4 Rogowski (90). Although this test was crucial for the broad acceptance of Einstein's theory, it was several decades before adequate measurements yielded a fully valid test.

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Overview of the Story*

First published in *The Strand Magazine*, December 1892.
Illustrations by Sidney Paget are from the original edition.**

Main Characters

John Straker, Silver Blaze's trainer, has been murdered.

Silver Blaze, race horse that is the favorite for the Essex Cup, has disappeared.

Fitzroy Simpson, the prime suspect, lurks around the stable and seeks inside information about the race.

Ned Hunter, stable boy, is drugged with opium concealed in curried mutton. As a consequence, he fails to guard Silver Blaze.

Gypsies (Romani), suspected of taking the horse.

Colonel Ross, owner of King's Pyland Stables and of Silver Blaze.

Causal Puzzle

Explaining the murder of John Straker and the disappearance of the horse.

Among the many Holmes stories, "Silver Blaze" provides some of the best examples of the detective's use of process tracing in addressing a causal puzzle.

The Adventure of Silver Blaze

Arthur Conan Doyle



am afraid, Watson that I shall have to go," said Holmes, as we sat down together to our breakfast one morning.

"Go! Where to?"

"To Dartmoor; to King's Pyland."

I was not surprised. Indeed, my only wonder was that he had not already been mixed up in this extraordinary case, which was the one topic of conversation through the length and breadth of England. For a whole day my companion had rambled about the room with his chin upon his chest and his brows knitted, charging and recharging his pipe with the strongest black tobacco, and absolutely deaf to any of my questions or remarks. Fresh editions of every paper had been sent up by our news agent, only to be glanced over and tossed down into a corner. Yet, silent as he was, I knew perfectly well what it was over which he was brooding. There was but one problem before the public which could challenge his powers of analysis, and that was the singular disappearance of the favorite for the Wessex Cup, and the tragic murder of its trainer. When, therefore, he suddenly announced his intention of setting out for the scene of the drama, it was only what I had both expected and hoped for.

"I should be most happy to go down with you if I should not be in the way," said I.

"My dear Watson, you would confer a great favor upon me by coming. And I think that your time will not be misspent, for there are points about the case which promise to make it an absolutely unique one. We have, I think, just time to catch our train at Paddington, and I will go further into the matter upon our journey. You would oblige me by bringing with you your very excellent field-glass."

And so it happened that an hour or so later I found myself in the corner of a first-class carriage flying

* This story is in the public domain. It was published by Public Domain Books, 1 May 1997. The text can be downloaded at no charge from Amazon.com as part of a Kindle book, *The Memoirs of Sherlock Holmes*. The download is available at <http://tinyurl.com/HolmesMemoirs>. Viewed 30 September 2011.

** Captions for the illustrations have been adapted to reflect the process-tracing tests of concern here. The references to table numbers in the captions correspond to the tables in Collier (2011).

along en route for Exeter, while Sherlock Holmes, with his sharp, eager face framed in his ear-flapped travelling-cap, dipped rapidly into the bundle of fresh papers which he had procured at Paddington. We had left Reading far behind us before he thrust the last one of them under the seat and offered me his cigar-case.

"We are going well," said he, looking out of the window and glancing at his watch. "Our rate at present is fifty-three and a half miles an hour."

"I have not observed the quarter-mile posts," said I.

"Nor have I. But the telegraph posts upon this line are sixty yards apart, and the calculation is a simple one. I presume that you have looked into this matter of the murder of John Straker and the disappearance of Silver Blaze?"

"I have seen what the *Telegraph* and the *Chronicle* have to say."

"It is one of those cases where the art of the reasoner should be used rather for the sifting of details than for the acquiring of fresh evidence. The tragedy has been so uncommon, so complete, and of such personal importance to so many people that we are suffering from a plethora of surmise, conjecture, and hypothesis. The difficulty is to detach the framework of fact—of absolute undeniable fact—from the embellishments of theorists and reporters. Then, having established ourselves upon this sound basis, it is our duty to see what inferences may be drawn and what are the special points upon which the whole mystery turns. On Tuesday evening I received telegrams from both Colonel Ross, the owner of the horse, and from Inspector Gregory, who is looking after the case, inviting my cooperation."

"Tuesday evening!" I exclaimed. "And this is Thursday morning. Why didn't you go down yesterday?"

"Because I made a blunder, my dear Watson—which is, I am afraid, a more common occurrence than anyone would think who only knew me through your memoirs. The fact is that I could not believe it possible that the most remarkable horse in England could long remain concealed, especially in so sparsely inhabited a place as the north of Dartmoor. From hour to hour yesterday I expected to hear that he had been found, and that his abductor was the murderer of John Straker. When, however, another

morning had come and I found that beyond the arrest of young Fitzroy Simpson nothing had been done, I felt that it was time for me to take action. Yet in some ways I feel that yesterday has not been wasted."

"You have formed a theory, then?"

"At least I have got a grip of the essential facts of the case. I shall enumerate them to you, for nothing clears up a case so much as stating it to another person, and I can hardly expect your cooperation if I do not show you the position from which we start."

I lay back against the cushions, puffing at my cigar, while Holmes, leaning forward, with his long, thin forefinger checking off the points upon the palm of his left hand, gave me a sketch of the events which had led to our journey.



Holmes outlines the case.

"Silver Blaze," said he, "is from the Somomy stock and holds as brilliant a record as his famous ancestor. He is now in his fifth year and has brought in turn each of the prizes of the turf to Colonel Ross, his fortunate owner. Up to the time of the catastrophe he was the first favorite for the Wessex Cup, the betting being three to one on him. He has always, however, been a prime favorite with the racing public and has never yet disappointed them, so that even at those odds enormous sums of money have been laid upon him. It is obvious, therefore, that there were many people who had the strongest interest in preventing Silver Blaze from being there at the fall of the flag next Tuesday.

"This fact was, of course, appreciated at King's Pyland, where the colonel's training stable is situated. Every precaution was taken to guard the favorite. The trainer, John Straker, is a retired jockey who rode in Colonel Ross's colors before he became too heavy for the weighing-chair. He has served the colonel for five years as jockey and for seven as trainer, and has always shown himself to be a zealous and honest servant. Under him were three lads, for the establishment was a small one, containing only four horses in all. One of these lads sat up each night in the stable, while the others slept in the loft. All three bore excellent characters. John Straker, who is a married man, lived in a small villa about two hundred yards from the stables. He has no children, keeps one maidservant, and is comfortably off. The country round is very lonely, but about half a mile to the north there is a small cluster of villas which have been built by a Tavistock contractor for the use of invalids and others who may wish to enjoy the pure Dartmoor air. Tavistock itself lies two miles to the west, while across the moor, also about two miles distant, is the larger training establishment of Mapleton, which belongs to Lord Backwater and is managed by Silas Brown. In every other direction the moor is a complete wilderness, inhabited only by a few roaming gypsies. Such was the general situation last Monday night when the catastrophe occurred.

"On that evening the horses had been exercised and watered as usual, and the stables were locked up at nine o'clock. Two of the lads walked up to the trainer's house, where they had supper in the kitchen, while the third, Ned Hunter, remained on guard. At a few minutes after nine the maid, Edith Baxter, carried down to the stables his supper, which consisted of a dish of curried mutton. She took no liquid, as there was a water-tap in the stables, and it was the rule that the lad on duty should drink nothing else. The maid carried a lantern with her, as it was very dark and the path ran across the open moor.

"Edith Baxter was within thirty yards of the stables when a man appeared out of the darkness and called to her to stop. As she stepped into the circle of yellow light thrown by the lantern she saw that he was a person of gentlemanly bearing, dressed in a gray suit of tweeds, with a cloth cap. He wore gaiters and carried a heavy stick with a knob to it. She was most impressed, however, by the extreme pallor of his face and by the nervousness of his manner. His

age, she thought, would be rather over thirty than under it.

"Can you tell me where I am?' he asked. 'I had almost made up my mind to sleep on the moor when I saw the light of your lantern.'



Curried mutton and a suspect:
Toward a smoking gun test? (Table 5)

"You are close to the King's Pyland training stables,' said she.

"Oh, indeed! What a stroke of luck!' he cried. 'I understand that a stable boy sleeps there alone every night. Perhaps that is his supper which you are carrying to him. Now I am sure that you would not be too proud to earn the price of a new dress, would you?' He took a piece of white paper folded up out of his waistcoat pocket. 'See that the boy has this to-night, and you shall have the prettiest frock that money can buy.'

"She was frightened by the earnestness of his manner and ran past him to the window through which she was accustomed to hand the meals. It was already opened, and Hunter was seated at the small table inside. She had begun to tell him of what had happened when the stranger came up again.

"Good-evening,' said he, looking through the window. 'I wanted to have a word with you.' The girl has

sworn that as he spoke she noticed the corner of the little paper packet protruding from his closed hand.

"What business have you here?" asked the lad.

"It's business that may put something into your pocket," said the other. "You've two horses in for the Wessex Cup—Silver Blaze and Bayard. Let me have the straight tip and you won't be a loser. Is it a fact that at the weights Bayard could give the other a hundred yards in five furlongs, and that the stable have put their money on him?"

"So, you're one of those damned touts!"* cried the lad. "I'll show you how we serve them in King's Pyland." He sprang up and rushed across the stable to unloose the dog. The girl fled away to the house, but as she ran she looked back and saw that the stranger was leaning through the window. A minute later, however, when Hunter rushed out with the hound he was gone, and though he ran all round the buildings he failed to find any trace of him."

"One moment," I asked. "Did the stable boy, when he ran out with the dog, leave the door unlocked behind him?"

"Excellent, Watson, excellent!" murmured my companion. "The importance of the point struck me so forcibly that I sent a special wire to Dartmoor yesterday to clear the matter up. The boy locked the door before he left it. The window, I may add, was not large enough for a man to get through.

"Hunter waited until his fellow grooms had returned, when he sent a message to the trainer and told him what had occurred. Straker was excited at hearing the account, although he does not seem to have quite realized its true significance. It left him, however, vaguely uneasy, and Mrs. Straker, waking at one in the morning, found that he was dressing. In reply to her inquiries, he said that he could not sleep on account of his anxiety about the horses, and that he intended to walk down to the stables to see that all was well. She begged him to remain at home, as she could hear the rain pattering against the window, but in spite of her entreaties he pulled on his large mackintosh and left the house.

"Mrs. Straker awoke at seven in the morning to find that her husband had not yet returned. She dressed

herself hastily, called the maid, and set off for the stables. The door was open; inside, huddled together upon a chair, Hunter was sunk in a state of absolute stupor, the favorite's stall was empty, and there were no signs of his trainer.

"The two lads who slept in the chaff-cutting loft above the harness-room were quickly aroused. They had heard nothing during the night, for they are both sound sleepers. Hunter was obviously under the influence of some powerful drug, and as no sense could be got out of him, he was left to sleep it off while the two lads and the two women ran out in search of the absentees. They still had hopes that the trainer had for some reason taken out the horse for early exercise, but on ascending the knoll near the house, from which all the neighboring moors were visible, they not only could see no signs of the missing favorite, but they perceived something which warned them that they were in the presence of a tragedy.

"About a quarter of a mile from the stables John Straker's overcoat was flapping from a furze bush. Immediately beyond there was a bowl-shaped depression in the moor, and at the bottom of this was found the dead body of the unfortunate trainer. His head had been shattered by a savage blow from some heavy weapon, and he was wounded on the thigh, where there was a long, clean cut, inflicted evidently by some very sharp instrument. It was clear, however, that Straker had defended himself vigorously against his assailants, for in his right hand he held a small knife, which was clotted with blood up to the handle, while in his left he clasped a red and black silk cravat, which was recognized by the maid as having been worn on the preceding evening by the stranger who had visited the stables. Hunter, on recovering from his stupor, was also quite positive as to the ownership of the cravat. He was equally certain that the same stranger had, while standing at the window, drugged his curried mutton, and so deprived the stables of their watchman. As to the missing horse, there were abundant proofs in the mud which lay at the bottom of the fatal hollow that he had been there at the time of the struggle. But from that morning he has disappeared, and although a large reward has been offered, and all the gypsies of Dartmoor are on the alert, no news has come of him. Finally, an analysis has shown that the remains of his supper left by the stable lad contained an appreciable

*A person who obtains inside information on race horses and sells it to gamblers.

quantity of powdered opium, while the people at the house partook of the same dish on the same night without any ill effect.

"Those are the main facts of the case, stripped of all surmise, and stated as baldly as possible. I shall now recapitulate what the police have done in the matter.

"Inspector Gregory, to whom the case has been committed, is an extremely competent officer. Were he but gifted with imagination he might rise to great heights in his profession. On his arrival he promptly found and arrested the man upon whom suspicion naturally rested. There was little difficulty in finding him, for he inhabited one of those villas which I have mentioned. His name, it appears, was Fitzroy Simpson. He was a man of excellent birth and education, who had squandered a fortune upon the turf, and who lived now by doing a little quiet and genteel book-making in the sporting clubs of London. An examination of his betting-book shows that bets to the amount of five thousand pounds had been registered by him against the favorite. On being arrested he volunteered the statement that he had come down to Dartmoor in the hope of getting some information about the King's Pyland horses, and also about Desborough, the second favorite, which was in charge of Silas Brown at the Mapleton stables. He did not attempt to deny that he had acted as described upon the evening before, but declared that he had no sinister designs and had simply wished to obtain first-hand information. When confronted with his cravat he turned very pale and was utterly unable to account for its presence in the hand of the murdered man. His wet clothing showed that he had been out in the storm of the night before, and his stick, which was a Penang lawyer weighted with lead, was just such a weapon as might, by repeated blows, have inflicted the terrible injuries to which the trainer had succumbed. On the other hand, there was no wound upon his person, while the state of Straker's knife would show that one at least of his assailants must bear his mark upon him. There you have it all in a nutshell, Watson, and if you can give me any light I shall be infinitely obliged to you."

I had listened with the greatest interest to the statement which Holmes, with characteristic clearness, had laid before me. Though most of the facts were familiar to me, I had not sufficiently appreciated their

relative importance, nor their connection to each other.

"Is it not possible," I suggested, "that the incised wound upon Straker may have been caused by his own knife in the convulsive struggles which follow any brain injury?"

"It is more than possible; it is probable," said Holmes. "In that case one of the main points in favor of the accused disappears."

"And yet," said I, "even now I fail to understand what the theory of the police can be."

"I am afraid that whatever theory we state has very grave objections to it," returned my companion. "The police imagine, I take it, that this Fitzroy Simpson, having drugged the lad, and having in some way obtained a duplicate key, opened the stable door and took out the horse, with the intention, apparently, of kidnapping him altogether. His bridle is missing, so that Simpson must have put this on. Then, having left the door open behind him, he was leading the horse away over the moor when he was either met or overtaken by the trainer. A row naturally ensued. Simpson beat out the trainer's brains with his heavy stick without receiving any injury from the small knife which Straker used in self-defence, and then the thief either led the horse on to some secret hiding-place, or else it may have bolted during the struggle, and be now wandering out on the moors. That is the case as it appears to the police, and improbable as it is, all other explanations are more improbable still. However, I shall very quickly test the matter when I am once upon the spot, and until then I cannot really see how we can get much further than our present position."

It was evening before we reached the little town of Tavistock, which lies, like the boss of a shield, in the middle of the huge circle of Dartmoor. Two gentlemen were awaiting us in the station—the one a tall, fair man with lion-like hair and beard and curiously penetrating light blue eyes; the other a small, alert person, very neat and dapper, in a frock-coat and gaiters, with trim little side-whiskers and an eyeglass. The latter was Colonel Ross, the well-known sportsman; the other, Inspector Gregory; a man who was rapidly making his name in the English detective service.

"I am delighted that you have come down, Mr. Holmes," said the colonel. "The inspector here has done all that could possibly be suggested, but I wish to leave no stone unturned in trying to avenge poor Straker and in recovering my horse."

"Have there been any fresh developments?" asked Holmes.

"I am sorry to say that we have made very little progress," said the inspector. "We have an open carriage outside, and as you would no doubt like to see the place before the light fails, we might talk it over as we drive."

A minute later we were all seated in a comfortable landau and were rattling through the quaint old Devonshire city. Inspector Gregory was full of his case and poured out a stream of remarks, while Holmes threw in an occasional question or interjection. Colonel Ross leaned back with his arms folded and his hat tilted over his eyes, while I listened with interest to the dialogue of the two detectives. Gregory was formulating his theory, which was almost exactly what Holmes had foretold in the train.

"The net is drawn pretty close round Fitzroy Simpson," he remarked, "and I believe myself that he is our man. At the same time I recognize that the evidence is purely circumstantial, and that some new development may upset it."

"How about Straker's knife?"

"We have quite come to the conclusion that he wounded himself in his fall."

"My friend Dr. Watson made that suggestion to me as we came down. If so, it would tell against this man Simpson."

"Undoubtedly. He has neither a knife nor any sign of a wound. The evidence against him is certainly very strong. He had a great interest in the disappearance of the favorite. He lies under suspicion of having poisoned the stable boy; he was undoubtedly out in the storm; he was armed with a heavy stick, and his cravat was found in the dead man's hand. I really think we have enough to go before a jury."

Holmes shook his head. "A clever counsel would tear it all to rags," said he. "Why should he take the horse

out of the stable? If he wished to injure it, why could he not do it there? Has a duplicate key been found in his possession? What chemist sold him the powdered opium? Above all, where could he, a stranger to the district, hide a horse, and such a horse as this? What is his own explanation as to the paper which he wished the maid to give to the stable boy?"

"He says that it was a ten-pound note. One was found in his purse. But your other difficulties are not so formidable as they seem. He is not a stranger to the district. He has twice lodged at Tavistock in the summer. The opium was probably brought from London. The key, having served its purpose, would be hurled away. The horse may be at the bottom of one of the pits or old mines upon the moor."

"What does he say about the cravat?"

"He acknowledges that it is his and declares that he had lost it. But a new element has been introduced into the case which may account for his leading the horse from the stable."

Holmes pricked up his ears.

"We have found traces which show that a party of gypsies encamped on Monday night within a mile of the spot where the murder took place. On Tuesday they were gone. Now, presuming that there was some understanding between Simpson and these gypsies, might he not have been leading the horse to them when he was overtaken, and may they not have him now?"

"It is certainly possible."

"The moor is being scoured for these gypsies. I have also examined every stable and outhouse in Tavistock, and for a radius of ten miles."

"There is another training stable quite close, I understand?"

"Yes, and that is a factor which we must certainly not neglect. As Desborough, their horse, was second in the betting, they had an interest in the disappearance of the favorite. Silas Brown, the trainer, is known to have had large bets upon the event, and he was no friend to poor Straker. We have, however, examined the stables, and there is nothing to connect him with the affair."

"And nothing to connect this man Simpson with the interests of the Mapleton stables?"

"Nothing at all."

Holmes leaned back in the carriage, and the conversation ceased. A few minutes later our driver pulled up at a neat little red-brick villa with overhanging eaves which stood by the road. Some distance off, across a paddock, lay a long gray-tiled outbuilding. In every other direction the low curves of the moor, bronze-coloured from the fading ferns, stretched away to the sky-line, broken only by the steeples of Tavistock, and by a cluster of houses away to the westward which marked the Mapleton stables. We all sprang out with the exception of Holmes, who continued to lean back with his eyes fixed upon the sky in front of him, entirely absorbed in his own thoughts. It was only when I touched his arm that he roused himself with a violent start and stepped out of the carriage.

"Excuse me," said he, turning to Colonel Ross, who had looked at him in some surprise. "I was day-dreaming." There was a gleam in his eyes and a suppressed excitement in his manner which convinced me, used as I was to his ways, that his hand was upon a clue, though I could not imagine where he had found it.

"Perhaps you would prefer at once to go on to the scene of the crime, Mr. Holmes?" said Gregory.

"I think that I should prefer to stay here a little and go into one or two questions of detail. Straker was brought back here, I presume?"

"Yes, he lies upstairs. The inquest is tomorrow."

"He has been in your service some years, Colonel Ross?"

"I have always found him an excellent servant."

"I presume that you made an inventory of what he had in his pockets at the time of his death, Inspector?"

"I have the things themselves in the sitting-room if you would care to see them."

"I should be very glad." We all filed into the front room and sat round the central table while the inspector unlocked a square tin box and laid a small

heap of things before us. There was a box of vestas [i.e., matches], two inches of tallow candle, an A.D.P briar-root pipe, a pouch of sealskin with half an ounce of long-cut Cavendish, a silver watch with a gold chain, five sovereigns in gold, an aluminum pencil-case, a few papers, and an ivory-handled knife with a very delicate, inflexible blade marked Weiss & Co., London.

"This is a very singular knife," said Holmes, lifting it up and examining it minutely. "I presume, as I see blood-stains upon it, that it is the one which was found in the dead man's grasp. Watson, this knife is surely in your line?"

"It is what we call a cataract knife," said I.

"I thought so. A very delicate blade devised for very delicate work. A strange thing for a man to carry with him upon a rough expedition, especially as it would not shut in his pocket."

"The tip was guarded by a disc of cork which we found beside his body," said the inspector. "His wife tells us that the knife had lain upon the dressing-table, and that he had picked it up as he left the room. It was a poor weapon, but perhaps the best that he could lay his hands on at the moment."

"Very possibly. How about these papers?"

"Three of them are receipted hay-dealers' accounts. One of them is a letter of instructions from Colonel Ross. This other is a milliner's* account for thirty-seven pounds fifteen made out by Madame Lesurier, of Bond Street, to William Derbyshire. Mrs. Straker tells us that Derbyshire was a friend of her husband's and that occasionally his letters were addressed here."

"Madame Derbyshire had somewhat expensive tastes," remarked Holmes, glancing down the account. "Twenty-two guineas is rather heavy for a single costume. However, there appears to be nothing more to learn, and we may now go down to the scene of the crime."

As we emerged from the sitting-room a woman, who had been waiting in the passage, took a step forward and laid her hand upon the inspector's sleeve. Her face was haggard and thin and eager, stamped with the print of a recent horror.

*A maker of woman's hats and clothing.

"Have you got them? Have you found them?" she panted.



Mrs. Straker does not recognize the dress
— a straw-in-the-wind test. (Table 3)

"No, Mrs. Straker. But Mr. Holmes here has come from London to help us, and we shall do all that is possible."

"Surely I met you in Plymouth at a garden party some little time ago, Mrs. Straker?" said Holmes.

"No, sir; you are mistaken."

"Dear me! Why, I could have sworn to it. You wore a costume of dove-colored silk with ostrich-feather trimming."

"I never had such a dress, sir," answered the lady.

"Ah, that quite settles it," said Holmes. And with an apology he followed the inspector outside. A short walk across the moor took us to the hollow in which the body had been found. At the brink of it was the furze bush upon which the coat had been hung.

"There was no wind that night, I understand," said Holmes.

"None, but very heavy rain."

"In that case the overcoat was not blown against the furze bush, but placed there."

"Yes, it was laid across the bush."

"You fill me with interest. I perceive that the ground has been trampled up a good deal. No doubt many feet have been here since Monday night."

"A piece of matting has been laid here at the side, and we have all stood upon that."

"Excellent."

"In this bag I have one of the boots which Straker wore, one of Fitzroy Simpson's shoes, and a cast horseshoe of Silver Blaze."

"My dear Inspector, you surpass yourself!" Holmes took the bag, and, descending into the hollow, he pushed the matting into a more central position. Then stretching himself upon his face and leaning his chin upon his hands, he made a careful study of the trampled mud in front of him. "Hullo!" said he suddenly. "What's this?" It was a wax vesta, half burned, which was so coated with mud that it looked at first like a little chip of wood.

"I cannot think how I came to overlook it," said the inspector with an expression of annoyance.

"It was invisible, buried in the mud. I only saw it because I was looking for it."

"What! You expected to find it?"

"I thought it not unlikely."

He took the boots from the bag and compared the impressions of each of them with marks upon the ground. Then he clambered up to the rim of the hollow and crawled about among the ferns and bushes.

"I am afraid that there are no more tracks," said the inspector. "I have examined the ground very carefully for a hundred yards in each direction."

"Indeed!" said Holmes, rising. "I should not have the impertinence to do it again after what you say. But I should like to take a little walk over the moor before it grows dark that I may know my ground to-morrow, and I think that I shall put this horseshoe into my pocket for luck."

Colonel Ross, who had shown some signs of impatience at my companion's quiet and systematic method of work, glanced at his watch. "I wish you would come back with me, Inspector," said he.

"There are several points on which I should like your advice, and especially as to whether we do not owe it to the public to remove our horse's name from the entries for the cup."

"Certainly not," cried Holmes with decision. "I should let the name stand."

The colonel bowed. "I am very glad to have had your opinion, sir," said he. "You will find us at poor Straker's house when you have finished your walk, and we can drive together into Tavistock."

He turned back with the inspector, while Holmes and I walked slowly across the moor. The sun was beginning to sink behind the stable of Mapleton, and the long sloping plain in front of us was tinged with gold, deepening into rich, ruddy browns where the faded ferns and brambles caught the evening light. But the glories of the landscape were all wasted upon my companion, who was sunk in the deepest thought.

"It's this way, Watson," said he at last. "We may leave the question of who killed John Straker for the instant and confine ourselves to finding out what has become of the horse. Now, supposing that he broke away during or after the tragedy, where could he have gone to? The horse is a very gregarious creature. If left to himself his instincts would have been either to return to King's Pyland or go over to Mapleton. Why should he run wild upon the moor? He would surely have been seen by now. And why should gypsies kidnap him? These people always clear out when they hear of trouble, for they do not wish to be pestered by the police. They could not hope to sell such a horse. They would run a great risk and gain nothing by taking him. Surely that is clear."

"Where is he, then?"

"I have already said that he must have gone to King's Pyland or to Mapleton. He is not at King's Pyland. Therefore he is at Mapleton. Let us take that as a working hypothesis and see what it leads us to. This part of the moor, as the inspector remarked, is very hard and dry. But it falls away towards Mapleton, and you can see from here that there is a long hollow over yonder, which must have been very wet on Monday night. If our supposition is correct, then the horse must have crossed that, and there is the point where we should look for his tracks."

We had been walking briskly during this conversation, and a few more minutes brought us to the hollow in question. At Holmes's request I walked down the bank to the right, and he to the left, but I had not taken fifty paces before I heard him give a shout and saw him waving his hand to me. The track of a horse was plainly outlined in the soft earth in front of him, and the shoe which he took from his pocket exactly fitted the impression.

"See the value of imagination," said Holmes. "It is the one quality which Gregory lacks. We imagined what might have happened, acted upon the supposition, and find ourselves justified. Let us proceed."

We crossed the marshy bottom and passed over a quarter of a mile of dry, hard turf. Again the ground sloped, and again we came on the tracks. Then we lost them for half a mile, but only to pick them up once more quite close to Mapleton. It was Holmes who saw them first, and he stood pointing with a look of triumph upon his face. A man's track was visible beside the horse's.

"The horse was alone before," I cried.

"Quite so. It was alone before. Hullo, what is this?"

The double track turned sharp off and took the direction of King's Pyland. Holmes whistled, and we both followed along after it. His eyes were on the trail, but I happened to look a little to one side and saw to my surprise the same tracks coming back again in the opposite direction.

"One for you, Watson," said Holmes when I pointed it out. "You have saved us a long walk, which would have brought us back on our own traces. Let us follow the return track."

We had not to go far. It ended at the paving of asphalt which led up to the gates of the Mapleton stables. As we approached, a groom ran out from them.

"We don't want any loiterers about here," said he.

"I only wished to ask a question," said Holmes, with his finger and thumb in his waistcoat pocket. "Should I be too early to see your master, Mr. Silas Brown, if I were to call at five o'clock to-morrow morning?"

"Bless you, sir, if anyone is about he will be, for he is always the first stirring. But here he is, sir, to answer your questions for himself. No, sir, no, it is as much as my place is worth to let him see me touch your money. Afterwards, if you like."

As Sherlock Holmes replaced the half-crown which he had drawn from his pocket, a fierce-looking elderly man strode out from the gate with a hunting crop swinging in his hand.

"What's this, Dawson!" he cried. "No gossiping! Go about your business! And you, what the devil do you want here?"



Holmes and Watson find Silver Blaze,
based on straw-in-the-wind and hoop tests.*

"Ten minutes' talk with you, my good sir," said Holmes in the sweetest of voices.

"I've no time to talk to every gadabout. We want no strangers here. Be off, or you may find a dog at your heels."

Holmes leaned forward and whispered something in the trainer's ear. He started violently and flushed to the temples.

"It's a lie!" he shouted. "An infernal lie!"

"Very good. Shall we argue about it here in public or talk it over in your parlor?"

"Oh, come in if you wish to."

Holmes smiled. "I shall not keep you more than a few minutes, Watson," said he. "Now, Mr. Brown, I am quite at your disposal."

It was twenty minutes, and the reds had all faded into grays before Holmes and the trainer reappeared. Never have I seen such a change as had been brought about in Silas Brown in that short time. His face was ashy pale, beads of perspiration shone upon his brow, and his hands shook until the hunting-crop wagged like a branch in the wind. His bullying, overbearing manner was all gone too, and he cringed along at my companion's side like a dog with its master.

"Your instructions will be done. It shall all be done," said he.

"There must be no mistake," said Holmes, looking round at him. The other winced as he read the menace in his eyes.

"Oh, no, there shall be no mistake. It shall be there. Should I change it first or not?"

Holmes thought a little and then burst out laughing. "No, don't," said he, "I shall write to you about it. No tricks, now, or—"

"Oh, you can trust me, you can trust me!"

"Yes, I think I can. Well, you shall hear from me tomorrow." He turned upon his heel, disregarding the trembling hand which the other held out to him, and we set off for King's Pyland.

"A more perfect compound of the bully, coward, and sneak than Master Silas Brown I have seldom met with," remarked Holmes as we trudged along together.

"He has the horse, then?"

"He tried to bluster out of it, but I described to him so exactly what his actions had been upon that morning that he is convinced that I was watching him. Of course you observed the peculiarly square toes in the impressions, and that his own boots exactly corresponded to them. Again, of course no subordinate would have dared to do such a thing. I described to him how, when according to his custom he was the first down, he perceived a strange horse wandering over the moor. How he went out to it, and

* The disappearance of the horse is not discussed in the examples presented in Collier (2011), yet it is a basic causal puzzle in this story.

his astonishment at recognizing, from the white forehead which has given the favorite its name, that chance had put in his power the only horse which could beat the one upon which he had put his money. Then I described how his first impulse had been to lead him back to King's Pyland, and how the devil had shown him how he could hide the horse until the race was over, and how he had led it back and concealed it at Mapleton. When I told him every detail he gave it up and thought only of saving his own skin."

"But his stables had been searched?"

"Oh, an old horse-faker like him has many a dodge."

"But are you not afraid to leave the horse in his power now since he has every interest in injuring it?"

"My dear fellow, he will guard it as the apple of his eye. He knows that his only hope of mercy is to produce it safe."

"Colonel Ross did not impress me as a man who would be likely to show much mercy in any case."

"The matter does not rest with Colonel Ross. I follow my own methods and tell as much or as little as I choose. That is the advantage of being unofficial. I don't know whether you observed it, Watson, but the colonel's manner has been just a trifle cavalier to me. I am inclined now to have a little amusement at his expense. Say nothing to him about the horse."

"Certainly not without your permission."

"And of course this is all quite a minor point compared to the question of who killed John Straker."

"And you will devote yourself to that?"

"On the contrary, we both go back to London by the night train."

I was thunderstruck by my friend's words. We had only been a few hours in Devonshire, and that he should give up an investigation which he had begun so brilliantly was quite incomprehensible to me. Not a word more could I draw from him until we were back at the trainer's house. The colonel and the inspector were awaiting us in the parlor

"My friend and I return to town by the night-express," said Holmes. "We have had a charming little breath of your beautiful Dartmoor air."

The inspector opened his eyes, and the colonel's lip curled in a sneer.

"So you despair of arresting the murderer of poor Straker," said he.

Holmes shrugged his shoulders. "There are certainly grave difficulties in the way," said he. "I have every hope, however, that your horse will start upon Tuesday, and I beg that you will have your jockey in readiness. Might I ask for a photograph of Mr. John Straker?"

The inspector took one from an envelope and handed it to him.

"My dear Gregory, you anticipate all my wants. If I might ask you to wait here for an instant, I have a question which I should like to put to the maid."

"I must say that I am rather disappointed in our London consultant," said Colonel Ross bluntly as my friend left the room. "I do not see that we are any further than when he came."

"At least you have his assurance that your horse will run," said I.

"Yes, I have his assurance," said the colonel with a shrug of his shoulders. "I should prefer to have the horse."

I was about to make some reply in defence of my friend when he entered the room again.

"Now, gentlemen," said he, "I am quite ready for Tavistock."

As we stepped into the carriage one of the stable lads held the door open for us. A sudden idea seemed to occur to Holmes, for he leaned forward and touched the lad upon the sleeve.

"You have a few sheep in the paddock," he said. "Who attends to them?"

"I do, sir."



Holmes discusses lame sheep with stable boy
– an auxiliary outcome test. (Table 7)

"Have you noticed anything amiss with them of late?"

"Well, sir, not of much account, but three of them have gone lame, sir."

I could see that Holmes was extremely pleased, for he chuckled and rubbed his hands together.

"A long shot, Watson, a very long shot," said he, pinching my arm. "Gregory, let me recommend to your attention this singular epidemic among the sheep. Drive on, coachman!"

Colonel Ross still wore an expression which showed the poor opinion which he had formed of my companion's ability, but I saw by the inspector's face that his attention had been keenly aroused.

"You consider that to be important?" he asked.

"Exceedingly so."

"Is there any point to which you would wish to draw my attention?"

"To the curious incident of the dog in the night-time."

"The dog did nothing in the night-time."

"That was the curious incident," remarked Sherlock Holmes.

Four days later Holmes and I were again in the train, bound for Winchester to see the race for the Wessex Cup. Colonel Ross met us by appointment outside

the station, and we drove in his drag to the course beyond the town. His face was grave, and his manner was cold in the extreme.

"I have seen nothing of my horse," said he.

"I suppose that you would know him when you saw him?" asked Holmes.

The colonel was very angry. "I have been on the turf for twenty years and never was asked such a question as that before," said he. "A child would know Silver Blaze with his white forehead and his mottled off-foreleg."

"How is the betting?"

"Well, that is the curious part of it. You could have got fifteen to one yesterday, but the price has become shorter and shorter, until you can hardly get three to one now."

"Hum!" said Holmes. "Somebody knows something, that is clear."

As the drag drew up in the enclosure near the grandstand I glanced at the card to see the entries.

Wessex Plate [it ran] 50 sovs. each h ft with 1000 sovs. added, for four and five year olds. Second, £300. Third, £200. New course (one mile and five furlongs).

1. Mr. Heath Newton's Nero. Red cap. Cinnamon jacket.
2. Colonel Wardlaw's Pugilist. Pink cap. Blue and black jacket.
3. Lord Backwater's Desborough. Yellow cap and sleeves.
4. Colonel Ross's Silver Blaze. Black cap. Red jacket.
5. Duke of Balmoral's Iris. Yellow and black stripes.
6. Lord Singleford's Rasper. Purple cap. Black sleeves.

"We scratched our other one and put all hopes on your word," said the colonel. "Why, what is that? Silver Blaze favorite?"

"Five to four against Silver Blaze!" roared the ring. "Five to four against Silver Blaze! Five to fifteen against Desborough! Five to four on the field!"

"There are the numbers up," I cried. "They are all six there."

"All six there? Then my horse is running," cried the colonel in great agitation. "But I don't see him. My colors have not passed."

"Only five have passed. This must be he."

As I spoke a powerful bay horse swept out from the weighing enclosure and cantered past us, bearing on its back the well-known black and red of the colonel.

"That's not my horse," cried the owner. "That beast has not a white hair upon its body. What is this that you have done, Mr. Holmes?"

"Well, well, let us see how he gets on," said my friend imperturbably. For a few minutes he gazed through my field-glass. "Capital! An excellent start!" he cried suddenly. "There they are, coming round the curve!"

From our drag we had a superb view as they came up the straight. The six horses were so close together that a carpet could have covered them, but halfway up the yellow of the Mapleton stable showed to the front. Before they reached us, however, Desborough's bolt was shot, and the colonel's horse, coming away with a rush, passed the post a good six lengths before its rival, the Duke of Balmoral's Iris making a bad third.

"It's my race, anyhow," gasped the colonel, passing his hand over his eyes. "I confess that I can make neither head nor tail of it. Don't you think that you have kept up your mystery long enough, Mr. Holmes?"

"Certainly, Colonel, you shall know everything. Let us all go round and have a look at the horse together. Here he is," he continued as we made our way into the weighing enclosure, where only owners and their friends find admittance. "You have only to wash his face and his leg in spirits of wine, and you will find that he is the same old Silver Blaze as ever."

"You take my breath away!"

"I found him in the hands of a faker and took the liberty of running him just as he was sent over."

"My dear sir, you have done wonders. The horse looks very fit and well. It never went better in its life.

I owe you a thousand apologies for having doubted your ability. You have done me a great service by recovering my horse. You would do me a greater still if you could lay your hands on the murderer of John Straker."

"I have done so," said Holmes quietly.

The colonel and I stared at him in amazement. "You have got him! Where is he, then?"

"He is here."

"Here! Where?"

"In my company at the present moment."

The colonel flushed angrily. "I quite recognize that I am under obligations to you, Mr. Holmes," said he, "but I must regard what you have just said as either a very bad joke or an insult."

Sherlock Holmes laughed. "I assure you that I have not associated you with the crime, Colonel," said he. "The real murderer is standing immediately behind you." He stepped past and laid his hand upon the glossy neck of the thoroughbred.



Holmes reveals his inference about the real murderer, based on a doubly-decisive test. (Table 6)

"The horse!" cried both the colonel and myself.

"Yes, the horse. And it may lessen his guilt if I say that it was done in self-defence, and that John Straker was a man who was entirely unworthy of your confidence. But there goes the bell, and as I stand to win a little on this next race, I shall defer a lengthy explanation until a more fitting time."

We had the corner of a Pullman car to ourselves that evening as we whirled back to London, and I fancy

that the journey was a short one to Colonel Ross as well as to myself as we listened to our companion's narrative of the events which had occurred at the Dartmoor training stables upon that Monday night, and the means by which he had unravelled them.

"I confess," said he, "that any theories which I had formed from the newspaper reports were entirely erroneous. And yet there were indications there, had they not been overlaid by other details, which concealed their true import. I went to Devonshire with the conviction that Fitzroy Simpson was the true culprit, although, of course, I saw that the evidence against him was by no means complete. It was while I was in the carriage, just as we reached the trainer's house, that the immense significance of the curried mutton occurred to me. You may remember that I was distraught and remained sitting after you had all alighted. I was marvelling in my own mind how I could possibly have overlooked so obvious a clue."

"I confess," said the colonel, "that even now I cannot see how it helps us."

"It was the first link in my chain of reasoning. Powdered opium is by no means tasteless. The flavor is not disagreeable, but it is perceptible. Were it mixed with any ordinary dish the eater would undoubtedly detect it and would probably eat no more. A curry was exactly the medium which would disguise this taste. By no possible supposition could this stranger, Fitzroy Simpson, have caused curry to be served in the trainer's family that night, and it is surely too monstrous a coincidence to suppose that he happened to come along with powdered opium upon the very night when a dish happened to be served which would disguise the flavor. That is unthinkable. Therefore Simpson becomes eliminated from the case, and our attention centers upon Straker and his wife, the only two people who could have chosen curried mutton for supper that night. The opium was added after the dish was set aside for the stable boy, for the others had the same for supper with no ill effects. Which of them, then, had access to that dish without the maid seeing them?

"Before deciding that question I had grasped the significance of the silence of the dog, for one true inference invariably suggests others. The Simpson incident had shown me that a dog was kept in the stables, and yet, though someone had been in and had fetched out a horse, he had not barked enough to

arouse the two lads in the loft. Obviously the midnight visitor was someone whom the dog knew well.

"I was already convinced, or almost convinced, that John Straker went down to the stables in the dead of the night and took out Silver Blaze. For what purpose? For a dishonest one, obviously, or why should he drug his own stable boy? And yet I was at a loss to know why. There have been cases before now where trainers have made sure of great sums of money by laying against their own horses through agents and then preventing them from winning by fraud. Sometimes it is a pulling jockey. Sometimes it is some surer and subtler means. What was it here? I hoped that the contents of his pockets might help me to form a conclusion.

"And they did so. You cannot have forgotten the singular knife which was found in the dead man's hand, a knife which certainly no sane man would choose for a weapon. It was, as Dr. Watson told us, a form of knife which is used for the most delicate operations known in surgery. And it was to be used for a delicate operation that night. You must know, with your wide experience of turf matters, Colonel Ross, that it is possible to make a slight nick upon the tendons of a horse's ham, and to do it subcutaneously, so as to leave absolutely no trace. A horse so treated would develop a slight lameness, which would be put down to a strain in exercise or a touch of rheumatism, but never to foul play."

"Villain! Scoundrel!" cried the colonel.

"We have here the explanation of why John Straker wished to take the horse out on to the moor. So spirited a creature would have certainly roused the soundest of sleepers when it felt the prick of the knife. It was absolutely necessary to do it in the open air."

"I have been blind!" cried the colonel. "Of course that was why he needed the candle and struck the match."

"Undoubtedly. But in examining his belongings I was fortunate enough to discover not only the method of the crime but even its motives. As a man of the world, Colonel, you know that men do not carry other people's bills about in their pockets. We have most of us quite enough to do to settle our own.

I at once concluded that Straker was leading a double life and keeping a second establishment. The nature of the bill showed that there was a lady in the case, and one who had expensive tastes. Liberal as you are with your servants, one can hardly expect that they can buy twenty-guinea walking dresses for their ladies. I questioned Mrs. Straker as to the dress without her knowing it, and, having satisfied myself that it had never reached her, I made a note of the milliner's address and felt that by calling there with Straker's photograph I could easily dispose of the mythical Derbyshire.

"From that time on all was plain. Straker had led out the horse to a hollow where his light would be invisible. Simpson in his flight had dropped his cravat, and Straker had picked it up—with some idea, perhaps, that he might use it in securing the horse's leg. Once in the hollow, he had got behind the horse and had struck a light; but the creature, frightened at the sudden glare, and with the strange instinct of animals feeling that some mischief was intended, had lashed out, and the steel shoe had struck Straker full on the forehead. He had already, in spite of the rain, taken off his overcoat in order to do his delicate task, and so, as he fell, his knife gashed his thigh. Do I make it clear?"

"Wonderful!" cried the colonel. "Wonderful! You might have been there!"

"My final shot was, I confess, a very long one. It struck me that so astute a man as Straker would not undertake this delicate tendon-nicking without a little practice. What could he practice on? My eyes fell upon the sheep, and I asked a question which, rather to my surprise, showed that my surmise was correct.

"When I returned to London I called upon the milliner, who had recognized Straker as an excellent customer of the name of Derbyshire, who had a very dashing wife with a strong partiality for expensive dresses. I have no doubt that this woman had plunged him over head and ears in debt, and so led him into this miserable plot."

"You have explained all but one thing," cried the colonel. "Where was the horse?"

"Ah, it bolted. and was cared for by one of your neighbors. We must have an amnesty in that direction, I think. This is Clapham Junction, if I am not mistaken, and we shall be in Victoria in less than ten minutes. If you care to smoke a cigar in our rooms, Colonel, I shall be happy to give you any other details which might interest you."