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How facts travel: The model systems of sociology

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Abstract

The discussion in the sociology of science about the role of model systems in biology provides an invitation to reflect on whether and how they operate in sociology in comparison to other disciplines. This paper shows that sociology too relies on objects of study that receive a disproportionate amount of attention and implicitly come to stand in for a specific class of objects. But, unlike other disciplines, sociology has no agreed language or theory to classify the discipline-specific objects that it studies, which hinders explicit reflection on the use of model systems across sociological subfields. The subfield of sociological theory uses model systems, but its specimens are not sociological objects. In contrast to other disciplines, which use model systems, specimens of sociological model systems usually do not travel. Because of this, the relationship between specimen and epistemic object is less standardised in sociology than in other disciplines. Sociology also encounters unique problems of access to model systems.

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1. Introduction

Scholars in biology address general questions about life and disease by working with specific organisms selected for convenience and by convention. For every type of system biologists are interested in (such as a virus, an invertebrate organism, or a mammal), scientists tend to select particular ones for the purposes of research. Organisms selected for study, such as, most famously, fruit flies and mice, are called “model organisms” or “model systems”. A model system links observations by different researchers in different sites; this allows a specific discovery to travel beyond its original site.

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Do sociologists use model systems? If so, what are they, what work do they do for the discipline, and what are the consequences of their use? Discussions in the sociology of science about how model systems operate in biology and other disciplines (Creager et al., 2007b; Ensmenger, 2012; Poovey, 2001) provide an invitation to reflect on how similar devices operate in sociology and how they operate in sociology in comparison to other disciplines. Thinking about the biological use of model systems provides an analogous language with which to inquire into the ways sociology selects and rewards research objects. It can complement existing methodological and political reflection with a perspective from the sociology of science that is oriented towards research practice and the materiality of research objects and data. This inquiry can help us bring together discussions focused on the status of the classics in sociological theory (Connell, 1997, 2007; Seidman, 1994) with discussions on case selection and bias in other fields, such as urban sociology (Small, 2007). Indeed, following a wave of canon wars, we are now in a position to include contestations – as well as contestations that did not take place – within our object of analysis.

Since this is, to our knowledge, the first article to link sociology to the discussion on model systems, the form of this article is comparative and exploratory. Our intention is to give food for thought for subsequent, more detailed, empirical studies on the issues we raise here. We begin the paper by re-introducing the question and the comparative agenda of the paper. We then discuss the use of model systems in biology, develop the notion of the model system as a tool for comparative inquiry, and distinguish some of its dimensions. Next, we argue that sociology too relies on objects that receive an inordinate amount of attention and implicitly come to stand in for a specific class of objects.

We then discuss three aspects of how sociological model systems work and how they are different from model systems in other disciplines. First, unlike other disciplines, sociology has no agreed language or theory for what the objects (e.g. cities, professions, organisations) it is studying are kinds of, which hinders explicit reflection on the use of model systems across subfields. Second, sociological model systems are different from model systems in other disciplines in terms of how they circulate. The specimens of biological model systems are standardised in laboratories and circulate as genetically identical items. In sociology, the specimens of model systems themselves usually do not circulate. Neither Chicago, the French Revolution, a large hospital, nor a car factory can be stabilised and made to circulate. The fact that specimen of sociological model systems do not circulate has consequences, which we elaborate on: namely, problems for standardisation and for access to the research objects. Finally, we look at the selective forms of contestation about model systems. Contestation of model systems within sociology has focused almost exclusively on groups of people, while there has been very little focus on other categories, such as organisations or professions.

2. Model-systems as fact-carriers: the ethnomethodological starting point

If we start with the ethnomethodological insistence on the primacy of the observable situation – if only for strategic purposes – any form of social order that transcends local situations becomes a puzzle for further research (Garfinkel, 1991). “How is social order possible?” becomes a real question. In this view, circulation is not in tension with social order – conceived not as a normative concept, but in its most basic notion as a link across locales and a recognisable form – but it is, rather, its prerequisite: something *must* circulate for social order to exist.

The sociology of science has used this insistence on the local and the question “How do facts travel?” – based upon the strategic construction of an imagined basic unit of knowledge – to open up new empirical questions about knowledge production; asking that question has allowed it to

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79 cast a spotlight on the concrete practices involved in the production of knowledge and on the
80 many steps involved in the creation and circulation of those practices (Howlett and Morgan,
81 2010; Latour and Woolgar, 1986). If we acknowledge that facts are always produced by a specific
82 researcher in a specific locale, it becomes interesting to observe how facts that are produced in
83 specific places are then transported to other places. They are usually attached to something in
84 order to travel, such as an author's name, a journal, or a piece of technology. In this article, we
85 discuss the way a specific carrier of facts operates in sociology, namely that of "model systems".

86 3. Model systems in biology

87
88 Let us first discuss the different elements of model system research in biology in order then to
89 compare them to other disciplines. By convention, biologists focus on a few selected species to
90 study the way organisms work:

91 Researchers selected this . . . assortment from tens of millions of possibilities because they
92 have common attributes as well as unique characteristics. They are practical: a model must
93 be cheap and plentiful; be inexpensive to house; be straightforward to propagate; have
94 short gestation periods that produce large numbers of offspring; be easy to manipulate in
95 the lab; and boost a fairly small and (relatively) uncomplicated genome. This type of
96 tractability is a feature of all well-used model systems (Bahls et al., 2003, quoted in
98 Creager et al., 2007a, p. 7).
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100 Several features of model system research are worth highlighting. First, model systems in
101 biology focus research and pool resources. Model systems lead to a specific logic of research
102 organisation: they concentrate a lot of work and researchers on one model system at the expense of
103 other objects. Studying model systems is different from a logic of coverage ("I study *x* because no
104 one has studied *x* before") that can be found in disciplines such as botany, history or anthropology.
105 Contrary to model systems, in the logic of coverage, the fact that some research has been done on
106 one case, one species or one tribe closes the case and drives other researchers to other cases, species
107 or tribes.¹ Model system research is also different from a logic of representativeness ("I study *x*
108 because it is representative of *y*"). Model system research focuses on specific cases and it does not
109 treat its specimens as direct representations of something else, but rather as opportunities for
110 research, and it does not aim at universal laws (Creager et al., 2007b, p. 2).

111 Second, model systems are consciously manipulated and standardised – Kohler (1994) calls
112 this 'organisms as technology' (p. 6). To turn individual specimens into instances of model
113 systems, they need to be manipulated in such a way that they are stable in defined respects over
114 different specimens. A drosophila needs to have known, defined, and stabilised genes and known
115 and stabilised forms of behaviour. Only once specimens are thus rendered stable, can they be
116 summarised as a model system. Because of this feature, model systems allow facts to travel
117 Q2 across contexts by seemingly making context irrelevant (Amann, 1994; Leonelli, 2008). Third,
118 standardisation of a model system is thought to render research comparable. Scientists working
119 on a specific strain of drosophila can assume that there is no, or only very little, variance in the
genotype and phenotype, and thus differences in research outcomes can be attributed to the

¹ This logic has been described memorably by Adam Kuper for Malinowskian anthropology in Cambridge, ca. 1960, as follows: 'An extreme but not exceptional view held that if a Malinowskian had worked in that region – or even in the same country – then it had been 'done' and one had best go somewhere else' (Kuper, 1999, p. 20).

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120 research rather than the organism. Fourth, this standardisation then allows research to be
121 cumulative. Scientists working on the same strain of drosophila can integrate research results
122 from another laboratory into their research. If one laboratory works on drosophila's vision, for
123 example, this research can be directly integrated into the work of other laboratories on muscular
124 movement in flight. For these reasons, model systems in biology can be explicitly enforced in the
125 name of efficiency, as in the case of, for example, applications for research grants, which might
126 be more easily awarded if a certain model system is used (Ankeny and Leonelli, 2011, p. 314).

127 The use of model systems also poses problems for research in biology. Because model systems
128 are standardised stand-ins, it is unclear how they relate to other objects. First, it is unclear how
129 they relate to their natural, unstabilised, non-standard relatives. Models systems are laboratory
130 products. They are made stable and contextless by laboratory work. The removal of the
131 stabilisation may also undo what is supposedly a feature of the organism, but what is in fact a
132 feature of the stabilisation procedure. Second, as stand-ins, it is unclear how they relate to what
133 they supposedly stand in for. Researchers may hope to find a gene for cancer in a mouse, but
134 finding it is not a proof that the same mechanism works in humans too. Or, researchers may test a
135 drug on a mouse that then proves fatal to humans in a trial (see Goodyear, 2006).

4. Towards a comparative analysis of model systems

136
137 The sociology, history and philosophy of science has drawn attention to the use of model
138 systems in biology, and it has more recently also discussed the role of similar fact-carriers in
139 other disciplines. Attention to model system research in biology has made it possible to see
140 similarities between the natural sciences and what researchers in the humanities and
141 interpretative social sciences already do, similarities that were previously obscured by an
142 exclusive normative focus on law-seeking physics (Creager et al., 2007b; Forrester, 2007;
143 Morgan, 2007; Ober, 2007). From the point of view of an empirical sociology of science, it is not
144 enough to celebrate attention to particular cases, as some of the discussion in the philosophy of
145 science has done (Creager et al., 2007a; Forrester, 1996). It is also important to pay close
146 attention to research practice and the materiality of research objects and data that the original
147 research on biology has collected and accept the invitation to observe other disciplines more
148 closely and ask how facts travel in these fields in order to spot similarities, differences and
149 contradictions (Amann, 1994; Ankeny and Leonelli, 2011; Kohler, 1994; Leonelli, 2008).

150 In what follows, we call a fact-carrier in other disciplines a model system if it serves as an
151 object of study that pools resources and is used by convention to stand in for a more general class
152 of epistemic objects. The knowledge gained through the analysis of model systems is supposed to
153 hold also for other, not clearly specified cases. Our analytical notion of model system here
154 subsumes what is also sometimes called “exemplars” (Kuhn, 1970, pp. 187–201),²
155 “paradigmatic cases”, or “canonical cases”. We group these together here initially, in order
156 to then discuss similarities and differences in various disciplines with regards to the relationship
157 between object studied and object known on a systematic basis, as discussed below. The concept
158 of ideal type, as formulated by Max Weber in his essay “‘Objectivity’ in Social Science”, in

² Thomas Kuhn has devoted a section of the second edition of *The Structure of Scientific Revolutions* to the role of exemplars (1970, postscript, pp. 187–201). He was mostly interested in the role of exemplars for stabilising normal, paradigmatic science and how scientific revolutions regroup exemplars (p. 200). For example, sun, moon and mars were grouped together before Copernicus and what was learnt from one of these exemplars could be applied to the others, something which became impossible after Copernicus.

Table 1
Comparison of the role of model systems across disciplines.

Discipline	Specimen	Model system	Kind of system	Most general category	General logic of research
<i>Biology</i> (Ankeny and Leonelli, 2011)	A particular fruit fly	Fruit fly	Invertebrate	Organism	Model systems and logic of coverage
<i>Literary studies</i> (Poovey, 2001)	This copy of <i>Othello</i>	<i>Othello</i>	Drama	Genre	Model systems and logic of coverage
<i>Sociology</i>	Chicago studied at a particular time	Chicago	City	Social form/ social system	Model systems and laws, NO logic of coverage
<i>International Relations</i> (Morgan, 2007)	–	Prisoner's dilemma	Key situations	Decision-making under conditions of interdependence	Model systems and laws
<i>Psychoanalysis</i> (Forrester, 1996, 2007)	Wolf Man, the patient	“Wolf Man” as a written case	Neurosis	Psyche	Model systems only
<i>Political Theory</i> (Ober, 2007)	Limited set of sources on “Athenian democracy”	Athenian democracy	Democracy	Political system	Model systems

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contrast, responds to a more specific methodological problem and is less useful for comparative analysis because of the normative orientation of its original formulation.³

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In order to understand the role model systems play in sociology, it is important to draw on the full range of possible comparisons. Table 1 illustrates some of the analogies we are drawing on with different disciplines. We have selected a number of disciplines, which are discussed in the literature on model systems and where observers have pointed to fact-carriers similar to model systems in biology. Of course, our claims here are only preliminary and cannot replace detailed investigation of these cases. However, the table presents the current state of the discussion and it allows us to identify important dimensions of model systems and important axes for comparison. In each of the examples of model systems we distinguish between the specimen, that is, the physical object that is examined or studied, and the different levels of things it is meant to stand in for. Furthermore, the column titled “General Logic of Research” indicates how disciplines combine model system research with other forms of research, such as the “logic of coverage” discussed above or the “search for general laws”.

We already discussed biology in detail in the preceding pages, so the first row should be self-explanatory. It is important to note that biology is diverse, uses both field and laboratory science,

³ The ideal type as conceived by Max Weber in his “‘Objectivity’ in Social Science” ‘is formed by the one-sided accentuation of one or more points of view and by the synthesis of a great many diffuse, discrete, more or less present and occasionally absent concrete individual phenomena, which are arranged according to those one-sidedly emphasized viewpoints into a unified analytical construct’ (2007[1904], p. 211). Weber here addresses the relationship between what in the table below is termed “specimen” and “kind of system” in a way that defends the usefulness of concept-formation. An ideal type has a very *loose* connection to empirical phenomena. Its quality and usefulness, but also its contested nature, derives precisely from its analytical and synthetic character, not from its close connection to some empirical specimen.

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175 and combines a logic of model systems with a logic of coverage. The second case, literary
176 studies, has been discussed by Poovey (2001) in direct comparison to model systems in biology.
177 She notes that *genre* fulfils a similar function in her discipline of literary studies as the one played
178 by the notion of *system* in biology. Conceiving of a specific object as an organic whole aids in
179 establishing a boundary for the discipline. It is the unity of *genre* that separates literary criticism
180 from just any reading of a text and that separates critical expertise from ethical evaluation.
181 Poovey notes that while biology has different kinds of systems that are of interest, such as cell,
182 species, or ecosystem, literature has only *genre*. We might add, as Poovey does not, that the
183 literary canon fulfils the same role as the agreement on specific model systems in biology.
184 Literary scholars focus attention on specific works that are said to exemplify a *genre*. This means
185 that Shakespeare's *Othello* is to drama as *Drosophila* is to invertebrate organism and Keat's "Ode
186 on a Grecian Urn" is to poem as mouse is to mammal. Like biology, literary studies complement
187 the logic of *genre* with the logic of coverage. Key works from key authors, such as Shakespeare's
188 dramas, give rise to an inordinate amount of research. At the same time, it is always possible to
189 claim a contribution to the field by analysing obscure and previously unjustly neglected authors, a
190 tendency memorably satirised in Lodge's *Small World* (2011[1984]).

191 Another case from the table, the Prisoner's dilemma within international relations as an
192 example for thought experiments (Morgan, 2007), is a special one where specimen and model
193 system coincide. Because thought experiments do not refer to an empirical case, they collapse the
194 case with the model system. This also explains why they easily resort not to a logic of coverage to
195 complement their research strategies, but to laws. The model system Prisoner's dilemma does not
196 need to be stabilised and thus it has already a law-like form. Rather than being confused by the
197 enormous amount of varying forms in the world, thought experiments dismiss these forms as
198 irrelevant for the pursuit of a given problem.

199 Psychoanalysis is a case that has long interested philosophers of science who have wanted to
200 rehabilitate attention to specific cases (Forrester, 1996). If we look closely and distinguish
201 between specimen and model system, it emerges as a curious case. While reference to
202 paradigmatic cases is clearly very important in orthodox psychoanalysis, only one researcher,
203 (usually) Sigmund Freud, has access to specimens. For all later psychoanalysts, the specimen is
204 accessible only through the case description provided by the actual therapist. Later
205 psychoanalysts discuss theoretical differences with reference not to restudies of Wolf Man,
206 but with reference to the interpretation of Freud's text on Wolf Man or his literary examples
207 (Sealey, 2011). Psychoanalysis shifts very quickly to a literary relationship to its own canon; it is
208 neither interested in a logic of coverage nor in laws. Although the large number of case
209 descriptions within psychoanalysis would indicate a logic of coverage, such a strategy is not
210 pursued, since each case is always reduced to the small number of guiding cases by the founders
211 of the discipline. We could call this logic the "logic of application", where new research
212 becomes relevant by a link to canonical description of previous research. This is also why
213 psychoanalysis, unlike anthropology or biology lacks a "map" of cases in the world, in which
214 white spots could be identified before undertaking research. Rather, an infinite number of
215 possible new cases are always linked back to the central case.

5. Model systems in sociology

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217 The question "Do sociologists use model systems?" can now be rephrased as "Do they use
218 objects of research that receive a disproportionate amount of attention and implicitly come to
219 stand as exemplars for a specific kind of object?". Some subfields of sociology clearly do not use

219 model systems. For example, survey research, demography and the quantitative sociology of
220 stratification and education do not use model systems, but rather seek to establish general laws by
221 working with datasets that are largely taken not as strategic cases but as representations of the real
222 world.

223 On the other hand, we argue that some prominent subfields in sociology clearly do use model
224 systems. Consider the following list of candidates for sociological model systems. We name the
225 model system first and then the type of object it stands in for, followed by an indication of some
226 exemplary and seminal literature that focuses on the model system (or literature that analyses the
227 literature on the model system).

- 229 (1) Doctors (professions) (Abbott, 1988; Becker et al., 1977).
- 230 (2) Chicago (cities) (Park et al., 1925).
- 231 (3) African-Americans in cities (race) (DuBois, 1899; Wilson, 1980, 1987).
- 232 (4) The French Revolution (radical social change) (Sewell, 1985; Skocpol, 1979, 1985).
- 233 (5) The biological laboratory (the production of scientific knowledge) (Latour and Woolgar,
234 1986; Knorr Cetina, 1981).
- 235 (6) The Scientific Revolution (the relationship of science and society) (Merton, 1938).
- 236 (7) English working class (class formation in capitalism) (Calhoun, 1982; Marx, 2007[1857];
237 Thompson, 1964).
- 238 (8) Car industry (organisation, work) (Rot, 2006).
- 239 (9) Women (gender studies).
- 240 (10) Juvenile petty criminals (the sociology of law, criminology) (Cohen, 1955; Shaw et al.,
241 1938).
- 242 (11) Marx, Durkheim, Weber (theory, history of sociology).
- 243 (12) High art (culture) (Becker et al., 1977; White and White, 1993).

244 There are important differences in what kind of objects these model systems are and how
245 specimen, object and general category relate; we discuss some of these differences below. But there
246 are a few general points we can make. First, there appears to be some relationship between model
247 systems and subfields as they exist today: some subfields use model systems and indeed model
248 systems may help cement their status as subfields. Studies about doctors are foundational for the
249 sociology of professions, studies about Chicago are foundational to urban sociology and urban
250 ethnography, and studies of the French Revolution are central to comparative-historical sociology.
251 Criminology has focused intensely on petty criminals and has, as a result, relatively neglected other
252 forms of criminals. Renault has served as a model system for the sociology of work done in France
253 (Rot, 2006). Sociological theory is still prominently shaped by a consideration and reconsideration
254 of the classic texts as model systems for sociological thought. The sociology of culture, while very
255 diverse in the topics it covers, is shaped by two model systems. For some of the work in this field, the
256 production of high art was foundational. It has also been suggested that the field as a broader area of
257 investigation implicitly uses religion as its model case for culture in general – consider the work of
258 both Weber and Durkheim – and that this legacy has shaped it in unacknowledged ways, by an
259 inherited opposition of culture to rationality for example (Altinordu, 2009).

260 Second, in each of these subfields, classic works on the model system are central to teaching
261 and to theoretical debate and model systems continue to concentrate a disproportionate amount
262 of resources in terms of scholarly time and attention. A reinterpretation of a classic case can
263 garner significant rewards in terms of attention and recognition, while it is more difficult for work
264 on an odd or unrecognisable case to be accepted as theoretically relevant.

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279 Third, model systems help to integrate micro- and macro-sociology or different theoretical
280 strands within one object. All model systems in sociology reproduce within themselves the
281 universe of approaches within sociology (see Abbott's (2001) book *Chaos of Disciplines*). Thus
282 within urban sociology, organisational sociology or the sociology of radical social change, an
283 integration and dispute between Parsonsian and Foucauldian or between interactionist and
284 structuralist approaches may happen.

285 Fourth, there is a complementary logic that values research on neglected cases. However,
286 these tend to be reproductions of the model systems for new and obscure cases, a logic we call
287 "logic of application": what is found to be true for juvenile delinquents in Chicago is also found
288 to be true with some divergences in Denver, and what is found to hold for doctors is found to hold
289 for priests as well. A version of this logic is observed by Connell (1997) as the phenomenon "X in
290 Australia" (p. 81). Researchers in Australia felt compelled to re-do canonical studies in other
291 settings: "The task of the Australian sociologist was to apply the metropolitan research
292 technique, demonstrate that the phenomenon also existed in Australia, and say empirically what
293 form it took here" (ibid.).

294 There is no logic of discovery attached to research on non-canonical cases: there is no prize to
295 be won for having done research in a remote village of Arkansas, such as there is for having found
296 a rare species in biology, a remote tribe in anthropology or an unknown language in linguistics.
297 The map of sociology does not define known and unknown points in a space; rather it identifies
298 cases in terms of their relative importance with regard to model systems.

6. The missing systematics of sociological objects

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300 In literature, the notion of genre provides a general category for what the canonical cases are
301 cases of in the way systems theory does for biology. Shakespeare's *Othello* is a drama, drama is a
302 genre. The fruitfly is an invertebrate, the invertebrate is a system. There is less consensus in
303 sociology as to what kinds of things the objects that it studies are (professions, cities, radical
304 social change). "Social forms" or indeed Durkheim's notion of "social fact" might be the most
305 plausible candidates for establishing categorisation. If Matthew Arnold established organic unity
306 within a form as the basis for genre theory and thereby distinguished literary criticism from
307 amateur reading, as Poovey (2001) discusses, the parallels to Durkheim's project are striking.
308 Durkheim is explicitly concerned with founding sociology as a discipline and he does so by
309 establishing social facts as a thing sui generis and making them available for *sociologists* to study
310 (Durkheim, 1982). Sociologists still seek to distinguish their own interpretations from those of
311 journalists and popularisers in the name of a specialised language about the nature of social
312 forms.

313 However, while such a project marked the beginning of sociology, there is no consensus in
314 contemporary sociology about how to think about these objects of sociological study and their
315 shared characteristics. Sociology has no language for describing its central overarching meta-
316 concepts and it has no theory of how these concepts relate to each other. Although terms such as
317 interaction, organisation, professions, science, religion, or culture are widely used to define
318 internal specialisations, it is the model systems themselves that describe these terms rather than a
319 theory that puts them in a relationship vis-à-vis each other. For example, there is no theory of how
320 science relates to professions and organisations (but see Abbott, 2005; Stichweh, 1994).

321 The exception in terms of an explicit theorisation of what sociological objects uniquely share
322 and also of different sociological objects, the one theory that delivers a sociological systematics,
323 is the systems theory of Niklas Luhmann, which remains at the periphery of Anglo-American

323 sociology. Luhmann provides a theoretical language that breaks radically with common sense,
324 thus pursuing a programme of disciplinary autonomy. He offers a framework for relating
325 sociological objects vis-à-vis each other. In Luhmannian systems theory there are different levels
326 of systems – functional systems, organisations and interaction systems (Luhmann, 1975, 1982
327 [especially Chapter 4], 1997) – each of which is defined by a different mode of communication.
328 These different forms can occur within each other – professions can be more or less organised,
329 functionally differentiated communication routinely occurs within interaction, etc. – but each of
330 these are accounted for in theoretical terms and each of them can be identified as empirically
331 relevant data. In fact, the very *raison d'être* of systems theory as an explicit theory of society (and
332 not a theory of a specific subsystem or field) could be said to clarify these relationships for
333 sociology and society. At the same time, the very fragmentation and lack of a theory of society in
334 Anglo-American sociology makes systems theory today so hard to understand in this context.

335 As we have outlined above, one reason for the use of model systems is that they allow to pool
336 research and therefore make it comparable and possible to integrate various research strands
337 (Ankeny and Leonelli, 2011, p. 314). Because so many biologists work on mice, it is possible for
338 one research group that works on behavioural experiments to use the results of another research
339 group that works on genetics. This is possible because there is a general theory of how different
340 levels or elements within a discipline relate to each other and the model system acts as a place
341 where these different strands come together. There is a shared systematics between subfields
342 (such as genetics and behavioural biology), which allows various research results to be related to
343 each other.

344 Because such a systematics is less clear in sociology, the possible gains from model systems
345 are more limited. The lack of an accepted systematics outside the community of scholars in the
346 tradition of systems theory and a theorisation of how different levels of society interrelate, makes
347 it difficult to reflect on the selection of model systems across subfields and to integrate findings
348 from different specialisations. Note that in the table above, there is no model organism that
349 overarches several subfields. Car factories are model systems for organisational sociology only,
350 and not for religious sociology or the sociology of ethnicity (although many questions within
351 these fields *could* be studied in car factories).

352 The subfield of sociological theory emerges as an odd case in this reflection – it has a high
353 agreement on the model systems selected for study, the theoretical canon, yet the units of this
354 canon are people and texts and thus not exemplars of sociological objects in any theoretical
355 language. Durkheim, Marx, and Weber are not social forms in any possible conceptualisation of
356 what a social form is. In sociological theory, the canon thus operates like a literary canon, but
357 without a theory of genre or a theory of how to work with texts. To some extent, the circulation of
358 facts via theorists is in tension with circulation via sociological model systems. When certain
359 authors are designated as theorists, their data becomes dissociated from the case and gets applied
360 as theory to other cases. For example, actor-network theory (ANT) initially started as a
361 description of biological laboratories, but its language later expanded to describe other objects in
362 the world, which in turn led researchers to designate these objects as laboratories (see
363 Guggenheim, forthcoming).
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7. Problems of circulation

365 Let us note some other differences between sociological model systems and biological model
366 systems. As discussed in our definition of the model system in general and shown by Kohler
367 (1994) and Amann (1994), model systems are stabilised in laboratories and circulate as
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369 genetically identical items. In sociology, due to the nature of the epistemic objects, the model
370 systems themselves usually do not circulate. Neither Chicago, the French Revolution, a large
371 hospital, nor a car factory can be stabilised and made to circulate. Sociologists do not usually
372 attempt to disconnect the epistemological objects from their (physical and immobile) context,
373 also because such a disconnection, a labourisation of the object, would appear to threaten for
374 many the interest of the object (see Guggenheim, forthcoming). Although there are both old and
375 more recent attempts to call sociological fields laboratories, which would imply control of
376 objects, sociologists rarely attempt such control. Sociologists believe that the situatedness of the
377 epistemic object forms precisely its value. In what follows we discuss two problems that result
378 from the fact that model systems do not circulate: Sociological model systems are not
379 standardised and are not easily accessible.

7.1. Degrees of standardisation

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381 Let us again examine the relationship between specimen and model system in different
382 disciplines. A specimen is the actual physical copy in front of the researcher, a model system is
383 the category that is studied through this. It is important to note here that researchers in some
384 disciplines go through a lot of trouble to make sure variation among specimens is controlled.
385 Consider the cases of biology and literary studies. Biologists do not all study the same animal-
386 say, drosophila- they try to control the variation among individual drosophilae studied and they
387 study similar drosophilae. They do not circulate the actual animal, but they try to produce
388 identical copies and circulate those. They isolate the object from its context – a ‘special kind of
389 domestication’, as Kohler (1994, p. 9) calls it. They usually study genetically identical drosophila
390 so that they know the variation observed is not due to genetic differences of the object of study, or
391 they study genetically different drosophila, but then they know about the differences between the
392 different genotypes.

393 The equivalent for literary studies is the physical copy of James Joyce’s *Ulysses*, for instance,
394 that a scholar is working with. Again, stabilisation happens through copying and multiplying the
395 research objects. Not all editions of the book are the same and indeed scholars pay much attention
396 to the differences between different editions in order to find out who is studying “the real” Joyce,
397 but also to make clear which differences of interpretation are owed to different versions of the
398 text (e.g. Rossman, 1988). Translations add another level of variation and issues of translation are
399 discussed as problems of research. But standard editions of texts go very far in making sure that
400 research objects are identical and deviations can be identified and named.

401 Some model systems lack an empirical referent and thus standardisation is less of a concern.
402 The prisoner’s dilemma or Galileo’s thought experiments with falling bodies exist only as mental
403 projections and there is nothing “out there” in the world that could vary (McAllister, 2005;
404 Sorensen, 1999).

405 In sociology, the model systems are conceived of as empirical objects but the specimens do not
406 travel and are not copied. Because of this, the objects of research are less standardised than in
407 other disciplines and different research projects on different specimens of the same model system
408 are not easily comparable. This creates problems for the accumulation of knowledge, which is the
409 implied justification for the use of model systems. Consider the case of Chicago. It is true that the
410 agreement among urban sociologists to focus on Chicago to some extent ensures comparability
411 even though Chicago is not representative of US cities, let alone cities in general. Among
412 sociological model systems Chicago is relatively stable. Unlike a profession, for example, it is
413 “locked in place”, and to a large extent geographic variation among specimens of the model

413
414 system is excluded. But even though Chicago as a model system is relatively stable, variation due
415 to time cannot be excluded and the variation of what one could look at, even if one studied it at the
416 same time – the informants that the researcher meets, the data considered – would be greater than
417 in disciplines where standardised copies circulate. The Chicago of the 1980s may be very
418 different from the Chicago of the 1990s. In the same way as one cannot swim in the same river
419 twice, as the saying goes, no two people study the same Chicago, and no individual studies
420 Chicago twice. In another example, different researchers in the sociology of professions study
421 different doctors and no sociologist is actively involved in manipulating doctors for the purposes
422 of standardisation for research. Hospitals, for example, are not passed on among researchers;
423 indeed access to an organisation is often so difficult that repeated research within a single
424 organisation is unlikely. A researcher who has secured access is likely to remain the only
425 researcher within any given organisation.

426 The fact that in sociology, classifications are often part of the object to be studied, what
427 Anthony Giddens (1993) calls ‘double hermeneutics’, is one aspect of the problem of
428 standardisation. Consider the case of petty criminals for criminology. Petty criminals represent
429 for sociology the relationship between the legal system and society (as opposed to, say,
430 administrative law or financial crimes, both understudied). But within the study of criminality,
431 the notion of what petty criminality as an object is, is vastly different in different places of study,
432 simply because the criminals in one place are different from those in another. Moreover, the
433 notion of the petty criminal itself is not standardised within sociology since it is not a sociological
434 notion, but a legal notion that is dependent on national and regional legal definitions particular
435 also to different historical circumstances. A comparative study of petty criminality has to grapple
436 with the problem that the systematics of the object is unstable over the cases and renders a
437 comparison difficult.

438 In some cases, sociologists can try to use attempts to standardise by social actors in the real
439 world as an opportunity to ensure comparability. The more control social actors have over
440 designing something, the more comparable the resulting objects are. In the French sociology of
441 work and organisations a large number of studies were conducted within the factories of one a
442 single manufacturer, namely Renault; here this fact was used to write a history of changing
443 working conditions within the automotive factory (see Perriaux, 1998; Rot, 2006). In cases where
444 blueprints do travel, such as for organisations or products, they have allowed comparative study
445 (Casper and Hanckj, 1999; Grandin, 2010). The problem of standardisation occurs in specific
446 ways when the object is historical, as in the case of the French Revolution, Greek democracy, or,
447 to a lesser degree, the Holocaust. In these cases, standardisation is possible to the extent that a
448 defined set of sources is equally available to researchers. The fewer the sources, the more
449 standardised and stabilised the model system. Standardisation and stabilisation in these cases is
450 less a result of a research practice, but of historical processes, in which only a small set of sources
451 survive. Here, sociology approximates literary studies in relation to its objects. Challenges to
452 standardisation then occur when new sources appear or when scholars widen the pool of sources;
453 examples include the interpretation of French history from the perspective of the provinces
454 (Weber, 1979) or from women’s point of view (Scott, 1986).

455 Here again sociological theory is a special case. In this case specimens do travel – in the form
456 of, for example, the physical copies of Durkheim’s *The Elementary Forms of Religious Life* or
457 Weber’s *Protestant Ethic*. The specimens here are highly standardised, but this is partly because
458 they have become disconnected from the sociological object they refer to. In social theory there is
459 a text-based canon and here sociology approaches the degree of standardisation common in
460 literary studies (with similar debates on the importance of different parts of an author’s work, but

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461 with less attention to editorial details; consider for example the debates about different parts of
462 Marx's opus and their implications for sociology (Althusser and Balibar, 1997; Musto, 2008). A
463 "theoretical" text within sociology does not necessarily contain less empirical data than
464 "empirical" texts. Theoretical debates are precisely theoretical because they do not go back to
465 the context of the empirical material within these texts, but treat them as self-contained texts.
466 Theory texts circulate in identical forms as literary texts, but there is no theory of their
467 relationship to sociological objects, and, as this is not literary studies, also no theory of the text as
468 text or its relationship to the author (cf. Cohen, 1999 on Latour and Koschorke, 1999 on
469 Luhmann).

7.2. Problems of access

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471 Because model systems exist in sociology, some objects receive a disproportionate amount of
472 attention and are implicitly assumed to stand in for other similar phenomena. But these model
473 systems do not, themselves, circulate. This means that researchers have unequal access to model
474 systems, and thereby unequal access to the possibility of producing knowledge that is thought to
475 be relevant and cumulative. The problem occurs on the level of regions and countries and is built
476 into the very foundations of the discipline. The concept of modernity has been central to
477 sociology and, as Chakrabarty (2000) has argued, Europe might have been the unacknowledged
478 model system for "modernity". France and Germany have served as model systems for Europe.
479 The very history of the discipline is based on the study of very small set of states (USA, France,
480 Germany, and Italy) (see also Wagner et al., 1991), which means that nationally specific model
481 systems are imposed on those scholars who do not live in these few countries. Those who live in
482 the global south, as well as in smaller European nations or Australia have a harder time
483 contributing to the seemingly cumulative research on model systems for societies.

484 An interesting case for this is the role of specific cities in urban sociology. As Thomas Gieryn
485 has shown, in early American sociology, Chicago sociologists managed to turn their field, the city
486 of Chicago, into *the* canonical research setting for urban sociology and the nascent discipline as a
487 whole (Gieryn, 2006). What was explored in Chicago as a specific field site became, through
488 what Gieryn calls the 'lab-field shuttle,' general knowledge about cities. Whoever worked at the
489 University of Chicago in these first decades of the twentieth century had the advantage of adding
490 to a seemingly cumulative research enterprise that collected knowledge about a specific field site
491 – Chicago – that was a stand in for "city" that was a stand in for "modern society", in a way in
492 which, for example, Heidelberg and Freiburg in Germany were not. This process was further
493 intensified by the canonisation of the Chicago school as the founding place for American
494 sociology. Knowledge about "the city" in the early twentieth century was difficult to achieve in
495 Denver, Freiburg or Maputo, because these places were not specimens of the model system and
496 doing research in Chicago was difficult and costly for researchers not based there.

497 With time, it became clear that Chicago was but one city among others, a city with a particular
498 structure that is not a model system for cities per se. Moreover, since the 1980s, it appears that
499 Chicago represented a model system that is no longer representative for the problems that
500 American cities face. Chicago was the dense city of the twentieth century that exposed the frantic
501 pace of industrial and financial centres and that drew a massive influx of migrants to the jobs these
502 industries offered. At the end of the century, Chicago was an outdated model and Los Angeles
503 became a new model system (see Dear and Dishman, 2001; Judd and Simpson, 2011). The city of
504 the late twentieth century was not a dense and hectic amalgam, but sprawl, a vast carpet of
505 uniform and indistinct buildings without a centre and connected by endless highways. Again, the

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506 ascent of these new model systems was proposed by scholars at universities located in the model
507 system itself who had easy access to this place, who could study it and highlight its peculiarities
508 and who could gain reputation for their universities by establishing this new model system there.
509 Today, Los Angeles, in turn, has lost its status as model system and it is the fast-growing cities of
510 the south, such as Lagos, Johannesburg, Istanbul, Cairo, Hong Kong and Shanghai that are now
511 replacing it. However, none of these cities seems to be considered as a model system, and it is
512 typical for the situation that they are rather lumped together into one category: “mega-cities of
513 the south”.

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514 However, while the model systems seem to be changing, the academic spaces of control
515 over these systems do not, or at least not with the same tightness as in the case of Chicago
516 and Los Angeles. Researchers who do work on the new model systems often come from far
517 away and the rise of these model systems owes more to the universities based in the old
518 model systems – Chicago, London and Los Angeles. Only with the shift of the model system
519 to the south has the link between institutional location and object of research been broken.
520 One reason for this is that those living and researching in the new model systems do not have
521 the institutional power to claim them as their own, while those who have institutional power
522 are now able to do research in far-away model systems as international travel has become fast
523 and cheap. The case for model systems based on textual sources and library research is
524 somewhat different. Access to the sources on the French Revolution or the Holocaust is not
525 equally distributed, but it is essentially similar to cases in history and literature. Sociological
526 theory, again, comes closest to the literary canon in that selection is biased but access is, in
527 material terms, relatively easy.

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8. The selective forms of contestation about model systems

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529 An important part of examining model systems, is to observe the ways in which they are
530 thought about and fought over. Future research could systematically address how different
531 disciplines observe themselves in this regard. We cannot fully do justice to this agenda here but
532 we can bring together what is known about different cases and offer some initial observations
533 about sociology.

534

535 The classic case of contestation about model systems is the canon wars in literary studies.
536 In literature, there has been an intense struggle around which novels come to represent
537 specific genres. Critics have asked if the established canon is representative of literary
538 production and of wider society and have pushed for the inclusion in it of popular culture as
539 well as marginalised voices, such as those of women and ethnic minorities. On the one hand,
540 literary scholars have insisted on a broader range of model systems, both in terms of which
541 books to select for study and which kinds of genres to include. In a stronger stance, critics
542 have questioned the pooling of resources associated with the use of model systems as well as
543 the relevance of the term genre altogether.⁴ This could be considered a rebellion against the
544 logic of model systems, either in the name of a traditional logic of coverage or a post-
545 structuralist version of it. In sociology, reflection on the use of model systems does not span
546 across subfields, is uneven within different subfields and selects specific forms of reflexivity
over others that would also be possible.

⁴ Guillory (1993) has analysed this as a displacement of social struggles into literature just at the time when the elites abandon classical liberal education as an important arena of social reproduction.

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In sociology, the most intense contestation has happened in sociological theory where the use of model systems is most explicit. Sociology has had its own canon wars where sociologists have fought to include different kinds of people such as women, people of colour and people from the global south as theorists (Connell, 1997, 2007; Seidman, 1994). We have said that what is odd about the case of sociological theory is that the model systems chosen here are not sociological phenomena at all, but rather individual people.

We have also seen contestation of other aspects of the use of model systems. We have witnessed a rebellion within the discipline against the white man as a model system for person, against the white middle-class woman as a model system for women (Hooks, 1981) and against the nuclear family as the model system for studying the family (Stacey, 1998). Chakrabarty (2000) has made the case for provincialising Europe; that is, he has criticised the social sciences for their implicit use of Europe as a model system for modernity or more generally, society. These interventions seem to be most effective when they are linked with domestic categories of political contestation, with the unit “people” or “groups of people”, but in doing so they have used the categories of social and political struggles for inclusion, rather than sociological concepts. But even in sociology, which is often said to be closer to political struggles than the humanities or the sciences, and for good reason, the metaphors of excluded people and groups do not fully cover the range of possible debates. Neglected cities, professions, organisations or crimes, for example, do not speak back as easily and scholars seem not to speak up in the same way on their behalf. The city of Cosenza, priests, vending machine operators or financial fraudsters do not have a lobby for inclusion in the same way as women or ethnic minorities do.

In addition to neglected cases, whole social forms can also be neglected as the result of the missing taxonomy discussed above. The lack of a taxonomy implies that sociology does not have a clear idea how the objects it researches relate to the universe of possible objects. The contestation of model systems depends then on individual scholars or groups of scholars who make it their case to dethrone a model system. However, because of personal and political dynamics, this rarely happens with a view of the universe of possible cases in mind. The tendency to reflect via categories of political contestation is reinforced through the institutions of human subjects review systems that are taken from medical research (see also Epstein, 2007). Procedures for the approval of research with human subjects ask for the justification of gender or race-specific sampling, but do not engage with case selection in general. One does not need to justify why medium-sized towns or certain professions, for instance, are not included in a study. We are now in an odd situation where no one explicitly makes the case for a greater efficiency of model systems vis-à-vis the logic of coverage or tries to explicitly exploit the advantages this can bring, while an implicit understanding about what are important cases and what are odd and unique cases continue to make it harder to do research on subjects like medium-sized cities, small European countries, small professions or unusual forms of crimes.

9. Conclusion

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We have argued that in sociology, as in some other disciplines, facts travel via model systems. An observation in a specific setting is aided when it gets attached to an established discussion on what is implicitly agreed to be an important case. Sociology relies on objects of study that receive a disproportionate amount of attention and implicitly come to stand as exemplars for a specific kind of object. But unlike biology and literary studies, sociology has

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592 no unified language for the kinds of things it is studying. Because specimens of sociological
593 model systems themselves do not travel, the relationship between specimen and epistemic
594 object is less standardised than in biology and literature and sociology encounters unique
595 problems of access to model systems; its forms of contestation draw on everyday categories,
596 rather than on specifically sociological terms.

597 In order to be able to better reflect on the implications of our choice of particular model
598 systems, we might first have to embrace the idea of a range of specifically sociological objects
599 (other than people or groups of people) that we study more explicitly – whether we call them
600 social forms, networks or systems. Empirically, taking the question “How do facts travel?”
601 seriously opens up further questions. The agenda for future research is, first, to do more empirical
602 work on the various model systems of sociology and other disciplines, with attention to the
603 relationship between specimen and epistemic object and attention to modes of reflection on
604 model systems. Second, the comparative task would be to contrast across disciplines how
605 different kinds of carriers of facts, such as authors’ careers, theories, model systems, institutional
606 prestige, periods, and subfields interact and what boundaries they encounter.

Uncited reference

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608 Q3 Turner (2000).

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References

615

616 Abbott, A.D., 1988. *The System of Professions: An Essay on the Division of Expert Labor*. University of Chicago Press,
617 Chicago.

618 Abbott, A.D., 2001. *The Chaos of Disciplines*. University of Chicago Press, Chicago.

619 Abbott, A.D., 2005. Linked ecologies: states and universities as environments for professions. *Sociological Theory* 23 (3),
620 245–274.

621 Althusser, L., Balibar, E., 1997. *Reading Capital*. Verso, London.

622 Altinordu, A., 2009. Ideology, identity, and religious politics. In: *ASA Junior Theorists Symposium*, University of
623 California, Berkeley, August 7.

624 Amann, K., 1994. Menschen, Mäuse und Fliegen: Eine wissenssoziologische Analyse der Transformation von Organis-
625 men in epistemische Objekte. *Zeitschrift fuer Soziologie* 23 (1), 22–40.

626 Ankeny, R.A., Leonelli, S., 2011. What’s so special about model organisms? *Studies in History and Philosophy of
627 Science Part A* 41 (1), 313–323.

628 Becker, H.S., et al., 1977. *Boys in White: Student Culture in Medical School*. Transaction Publishers, New York.

629 Calhoun, C.J., 1982. *The Question of Class Struggle: Social Foundations of Popular Radicalism during the Industrial
630 Revolution*. University of Chicago Press, Chicago.

631 Casper, S., Hanckj, B., 1999. Global quality norms within national production regimes: ISO 9000 standards in the French
632 and German car industries. *Organization Studies* 20 (6), 961–985.

633 Chakrabarty, S.D., 2000. *Provincializing Europe: Post-Colonial Thought and Historical Difference*. Princeton University
634 Press, Princeton, NJ.

635 Cohen, A., 1955. *Delinquent Boys: The Culture of the Gang*. Free Press, Glencoe, IL.

- 635
636 Cohen, S., 1999. Reading science studies writing. In: Biagioli, M. (Ed.), *The Science Studies Reader*. Routledge, New
637 York, pp. 84–94.
- 638 Connell, R.W., 1997. Why is classical theory classical? *American Journal of Sociology* 102 (6), 1511–1557.
- 639 Connell, R., 2007. *Southern Theory: The Global Dynamics of Knowledge in Social Science*. Polity Press, Cambridge,
640 UK.
- 641 Creager, A.N.H., Lunbeck, E., Wise, M.N., 2007a. Introduction. In: Creager, A.N.H., Lunbeck, E., Wise, M.N.
642 (Eds.), *Science without Laws: Model Systems, Cases, Exemplary Narratives*. Duke University Press, Chapel
643 Hill, pp. 1–20.
- 644 Creager, A.N.H., Lunbeck, E., Wise, M.N., 2007b. *Science Without Laws: Model Systems, Cases, Exemplary Narratives*.
645 Duke University Press, Chapel Hill.
- 646 Dear, M., Dishman, J.D. (Eds.), 2001. *From Chicago to L.A.: Making Sense of Urban Theory*. Sage Publications,
647 Thousand Oaks, CA.
- 648 DuBois, W.E.B., 1899. *The Philadelphia Negro: A Social Study*. University of Pennsylvania Press, Philadelphia.
- 649 Durkheim, E., 1982. *The Rules of Sociological Method*. Free Press, New York.
- 650 Ensmenger, N., 2012. Is chess the drosophila of AI? A social history of an algorithm. *Social Studies of Science* 42 (1),
651 5–130.
- 652 Epstein, S., 2007. *Inclusion: The Politics of Difference in Medical Research*. University of Chicago Press, Chicago.
- 653 Forrester, J., 1996. If p, then what? Thinking in cases. *History of the Human Sciences* 9 (3), 1–25.
- 654 Forrester, J., 2007. The psychoanalytic case: voyeurism, ethics, and epistemology in Robert Stoller's *Sexual Excitement*.
655 In: Creager, A.N.H., Lunbeck, E., Wise, M.N. (Eds.), *Science without Laws: Model Systems, Cases, Exemplary
656 Narratives*. Duke University Press, Chapel Hill, pp. 189–212.
- 657 Garfinkel, H., 1991. Respecification: evidence for locally produced, naturally accountable phenomena of order, logic,
658 reason, meaning, method, etc., in and as of the essential haecceity of immortal ordinary society (I)—an announcement
659 of studies. In: Button, G. (Ed.), *Ethnomethodology and the Human Sciences*. Cambridge University Press, Cambridge,
660 UK, pp. 10–19.
- 661 Giddens, A., 1993. *New Rules of Sociological Method: A Positive Critique of Interpretative Sociologies*. Stanford
662 University Press, Stanford, CA.
- 663 Gieryn, T.F., 2006. City as truth-spot: laboratories and field-sites in urban studies. *Social Studies of Science* 36 (1), 5–38.
- 664 Goodyear, M., 2006. Learning from the TGN1412 trial. *British Medical Journal* 332 (7543), 677–678.
- 665 Grandin, G., 2010. *Fordlandia: The Rise and Fall of Henry Ford's Forgotten Jungle City*. Macmillan, Oxford, UK.
- 666 Q4 Guggenheim, M. *Laboratizing and delaboratizing the world: changing sociological concepts for places of knowledge
667 production*. *History of the Human Sciences*, forthcoming.
- 668 Guillory, J., 1993. *Cultural Capital: The Problem of Literary Canon formation*. University of Chicago Press, Chicago.
- 669 Hooks, b., 1981. *Ain't I a Woman: Black Women and Feminism*. South End Press, Boston.
- 670 Howlett, P., Morgan, M.S., 2010. *How Well Do Facts Travel? The Dissemination of Reliable Knowledge*. Cambridge
671 University Press, Cambridge, UK.
- 672 Judd, D.R., Simpson, D. (Eds.), 2011. *The City, Revisited: Urban theory from Chicago*. University of Minnesota Press,
673 Minneapolis, Los Angeles, and New York.
- 674 Knorr Cetina, K., 1981. *The Manufacture of Knowledge: An Essay on the Constructivist and Contextual Nature of
675 Science*. Pergamon Press, Oxford.
- 676 Kohler, R., 1994. *Lords of the Fly: Drosophila Genetics and the Experimental Life*. University of Chicago Press, Chicago.
- 677 Koschorke, A., 1999. Die Grenzen des Systems und die Rhetorik der Systemtheorie. In: Koschorke, A., Vismann, C.
678 (Eds.), *Widerstände der Systemtheorie: kulturtheoretische Analysen zum Werk von Niklas Luhmann*. Akademie
679 Verlag, Berlin, pp. 49–62.
- 680 Kuhn, T.S., 1970. The structure of scientific revolutions. In: *International Encyclopedia of Unified Science*, vol. 2, 2nd ed.
681 University of Chicago Press, Chicago.
- 682 Kuper, A., 1999. Postmodernism, Cambridge and the great Kalahari debate. In: Kuper, A. (Ed.), *Among the Anthro-
683 pologists: History and Context in Anthropology*. Athlone, London, pp. 15–35.
- 684 Latour, B., Woolgar, S., 1986. *Laboratory Life: The Construction of Scientific Facts*. Princeton University Press,
685 Princeton, NJ.
- 686 Leonelli, S., 2008. Circulating evidence across research contexts: the locality of data and claims in model organism
687 biology. *LSE Working Papers on the Nature of Evidence: How Well Do 'Facts' Travel?* No. 25.
- 688 Lodge, D., 2011[1984]. *Small World*. Vintage, London.
- 689 Luhmann, N., 1975. Interaktion, organisation, gesellschaft. In: *Soziologische Aufklärung 2*, Westdeutscher Verlag,
690 Opladen, pp. 9–20.
- 691 Luhmann, N., 1982. *The Differentiation of Society*. Columbia University Press, New York.

- 691
692 Luhmann, N., 1997. Die Gesellschaft der Gesellschaft. Suhrkamp, Frankfurt.
693 Marx, K., 2007[1857]. Capital: A Critique of Political Economy, Volume I, Part I: The Process of Capitalist Production.
694 Cosimo Inc., New York.
695 McAllister, J.W., 2005. The virtual laboratory: thought experiments in seventeenth-century mechanics. In: Schramm,
696 H., Schwarte, L., Lazardzig, J. (Eds.), Collection, Laboratory, Theater: Scenes of Knowledge in the 17th Century.
697 Walter de Gruyter, Berlin, pp. 35–56.
698 Merton, R.K., 1938. Science, Technology and Society in 17th Century England. St. Catherine Press, Bruges, Belgium.
699 Morgan, M.S., 2007. The curious case of the prisoner's dilemma: model situation? Exemplary narrative?. In: Creager,
700 A.N.H., Lunbeck, E., Wise, M.N. (Eds.), Science Without Laws: Model Systems, Cases, Exemplary Narratives.
701 Duke University Press, Chapel Hill, pp. 157–186.
702 Musto, M., 2008. Karl Marx's Grundrisse: Foundations of the Critique of Political Economy 150 Years Later. Taylor and
703 Francis, London.
704 Ober, J., 2007. Democratic Athens as an experimental system: history and the project of political theory. In: Creager,
705 A.N.H., Lunbeck, E., Wise, M.N. (Eds.), Science Without Laws: Model Systems, Cases, Exemplary Narratives.
706 Duke University Press, Chapel Hill, pp. 225–243.
707 Park, R., et al., 1925. The City. Chicago University Press, Chicago.
708 Perriaux, A.-S., 1998. Renault et les sciences sociales, 1948–1991. Seli Arslan, Paris.
709 Poovey, M., 2001. The model system of contemporary literary criticism. *Critical Inquiry* 27, 408–438.
710 Rossman, C., 1988. The new 'Ulysses': the hidden controversy. *The New York Review of Books* 35, 53–58.
711 Rot, G., 2006. Sociologie de l'atelier: Renault, le travail ouvrier et le sociologue. In: Octarès, Toulouse, France.
712 Scott, J.W., 1986. Gender: a useful category of historical analysis. *The American Historical Review* 91 (5),
713 1053–1075.
714 Sealey, A., 2011. The strange case of the Freudian case history: the role of long case histories in the development of
715 psychoanalysis. *History of the Human Sciences* 24 (1), 36–50.
716 Seidman, S., 1994. The Postmodern Turn: New Perspectives on Social Theory. Cambridge University Press, Cambridge.
717 Sewell, W.H., 1985. Ideologies and social revolutions: reflections on the French case. *Journal of Modern History* 57 (1),
718 57–85.
719 Shaw, C., et al., 1938. Brothers in Crime. University of Chicago Press, Chicago.
720 Skocpol, T., 1979. States and Social Revolutions: A Comparative Analysis of France, Russia, and China. Cambridge
721 University Press, Cambridge.
722 Skocpol, T., 1985. Cultural idioms and political ideologies in the revolutionary reconstruction of state power: a rejoinder
723 to Sewell. *Journal of Modern History* 57 (1), 86–96.
724 Small, M.L., 2007. Is there such a thing as 'The Ghetto'? The perils of assuming that the South Side of Chicago represents
725 poor black neighborhoods. *City* 11 (3), 413–421.
726 Sorensen, R.A., 1999. Thought Experiments. Oxford University Press, Oxford.
727 Stacey, J., 1998. Brave New Families: Stories of Domestic Upheaval in Late-Twentieth-Century America. University of
728 California Press, Berkeley, CA.
729 Stichweh, R., 1994. Professionen und Disziplin: Formen der Differenzierung zweier Systeme beruflichen Handelns in
730 modernen Gesellschaften. In: Stichweh, R. (Ed.), Wissenschaft, Universität, Professionen. Suhrkamp, Frankfurt am
731 Main, pp. 278–336.
732 Thompson, E.P., 1964. The Making of the English Working Class. Pantheon Books, New York.
733 Turner, S., 2000. What are disciplines? And how is interdisciplinarity different?. In: Weingart, P., Stehr, N. (Eds.),
734 Practising Interdisciplinarity. University of Toronto Press, Toronto, pp. 46–65.
735 Wagner, P., Wittrock, B., Whitley, R. (Eds.), 1991. Discourses on Society. The Shaping of the Social Science Disciplines.
736 Kluwer Academic Publishers, Dordrecht, The Netherlands.
737 Weber, E., 1979. Peasants into Frenchmen: The Modernization of Rural France, 1870–1914. Stanford University Press,
738 Stanford.
739 Weber, M., 2007[1904]. "Objectivity" in social science. In: Calhoun, C., et al. (Eds.), Classical Sociological Theory.
740 Wiley-Blackwell, Malden, MA, pp. 211–217.
741 White, H.C., White, C.A., 1993. Canvases and Careers: Institutional Change in the French Painting World. University of
742 Chicago Press, Chicago.
743 Wilson, W.J., 1980. The Declining Significance of Race: Blacks and Changing American Institutions. University of
744 Chicago Press, Chicago.
745 Wilson, W.J., 1987. The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy. University of Chicago
746 Press, Chicago.
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