Users as Agents of Technological Change: The Social Construction of the Automobile in the Rural United States

RONALD KLINE AND TREVOR PINCH

Historians and social commentators generally assume that the automobile has transformed American society. There can be little doubt that America has become a "car culture." But rather less attention has been given to how American society shaped the car—particularly rural society. Although historians usually mention the farm background of Henry Ford and describe the importance of the rural market in the diffusion of the automobile in North America, they have, by far, concentrated on the history of the car in urban settings. Most authors relate the technical, business, and social history of the automobile in terms of urban inventors, urban manufacturers, city pleasures, city traffic jams, and suburban sprawl.[1] Those

DR. KLINE is associate professor of the history of technology at Cornell University, with a joint appointment between the College of Engineering and the Science and Technology Studies Department. DR. PINCH is professor of the sociology of science and technology in the Science and Technology Studies Department at Cornell. An earlier version of this paper was presented to the workshop on "The Car and Its Environment: The Past, Present and Future of the Motorcar in Europe," University of Trondheim, May 6–8, 1993. The authors are grateful to participants at the conference for their comments on that version, and to Michael Dennis and the *Technology and Culture* referees for comments on other drafts. They would also like to acknowledge the research assistance of Chris Finlayson, Simon Cole, and Miranda Paton; Suzanne Moon for conducting oral history interviews in New York state; and Terry Hoover, Bob Casey, and their coworkers at the Henry Ford Museum for their assistance. Research for this paper was supported by National Science Foundation Grant Number SBR-9321180.

[1]See, e.g., John Rae, *The American Automobile: A Brief History* (Chicago, 1965); James J. Flink, *America Adopts the Automobile, 1895–1910* (Cambridge, Mass., 1970), *The Car Culture* (Cambridge, Mass., 1975), and *The Automobile Age* (Cambridge, Mass., 1990); David L. Lewis, *The Public Image of Henry Ford: An American Folk Hero and His Company* (Detroit, 1976); Lewis and Laurence Goldstein, eds., *The Automobile and American Culture* (Ann Arbor, 1983), which has one chapter by Reynold Wik on rural life; Virginia Scharff, *Taking the Wheel: Women and the Coming of the Motor Age* (New York, 1991); and Clay McShane, *Down the Asphalt Path: The Automobile and the American City* (New York, 1994), pp. 176–80.

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who have studied the automobile in the American countryside have concentrated on the social "impact" of the car and the fascination of rural people with Henry Ford and his Model T. Most have seen the car as an "external" force that transformed rural society, usually by urbanizing it.[2] They have described in passing how farm people used the car or modified it for purposes not intended by manufacturers. But these actions have taken a backseat to a form of technological determinism evident in most rural as well as urban automotive histories, in which autonomous technological forces drive social change.[3] In this essay, we turn these assumptions around and argue that users of technology acted as agents of technological change. By treating farm people as active participants in the social construction of the automobile, we seek to extend recent work in the history of technology that shifts the field's traditional focus from the "producers" of technology (e.g., inventors, engineers, and manufacturers) to the "users" of technology (e.g., laborers, factory owners, homeworkers, and consumers).[4] Within this growing body of scholarship,

[2]The major works are Reynold M. Wik, *Henry Ford and Grass-Roots America* (Ann Arbor, 1972); Michael L. Berger, *The Devil Wagon in God's Country: The Automobile and Social Change in Rural America, 1893–1929* (Hamden, Conn., 1979); Joseph Interrante, "You Can't Go to Town in a Bathtub: Automobile Movement and the Reorganization of Rural American Space, 1900–1930," *Radical History Review* 21 (1979): 151–68; and Peter J. Ling, *America and the Automobile: Technology, Reform, and Social Change* (Manchester, 1990), ch. 2.

[3]For a criticism of Flink's technological determinism, see Eric H. Monkkonen, *America Becomes Urban: The Development of U.S. Cities & Towns, 1780–1980* (Berkeley, 1988), n. 10, p. 285. Ling's *America and the Automobile* is much less deterministic. On forms of technological determinism, see Bruce Bimber, "Three Faces of Technological Determinism," in *Does Technology Drive History? The Dilemma of Technological Determinism*, ed. Merrit Roe Smith and Leo Marx (Cambridge, Mass., 1994), pp. 79–100.

[4]See, e.g., Susan Strasser, *Never Done: A History of American Housework* (New York, 1982); Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York, 1983); Carolyn Marvin, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (New York, 1988); Philip Scranton, "None-Too-Porous Boundaries: Labor History and the History of Technology," *Technology and Culture* 29 (1988): 722–43; Judith McGaw, *Most Wonderful Machine: Mechanization and Social Change in Berkshire Paper Making, 1801–1885* (Princeton, N. J., 1987); Donald Reid, *Paris Sewers and Sewermen: Representations and Realities* (Cambridge, Mass., 1991). Recent scholarship on how people experienced technology includes Wolfgang Schivelbusch, *Disenchanted Night: The Industrialization of Light in the Nineteenth Century*, trans. Angela Davis (Berkeley, 1988); Rosalind Williams, *Notes on the Underground: An Essay on Technology, Society, and the Imagination* (Cambridge, Mass., 1990); and David E. Nye, *American Technological Sublime* (Cambridge, Mass., 1994). For a plea for more scholarship on consumers, see Cowan, "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, ed. Wiebe Bijker, Thomas Hughes, and Trevor Pinch (Cambridge, Mass., 1987), pp. 261–80.

we support a more specific claim that the use of an artifact or system has not only resulted in unforeseen consequences, but that users have helped to shape the artifact or system itself. Susan Douglas, for example, has demonstrated that radio amateurs helped change the dominant interpretation of radio from point-to-point communication to broadcasting. Claude Fischer and Michele Martin have argued that the actions of telephone callers eventually convinced the industry to regard the telephone as a social, as well as a business, instrument. And David Nye has described the manifold social meanings given to electric streetlights, trolleys, factories, appliances, and electricity itself by a wide variety of users.[5] Our case study on the automobile goes beyond this work to consider how actions taken by users resulted in changes to both the interpretation and design of an artifact considered to be relatively stable.

SCOT

Although Douglas, Fischer, and Nye have used the rubric of "the social construction of technology," we maintain that a specific model known as SCOT (Social Construction of Technology), developed by Trevor Pinch and Wiebe Bijker in the 1980s, has several advantages in analyzing users as agents of technological change.[6] In SCOT, "relevant social groups" who play a role in the development of a technological artifact are defined as those groups who share a meaning of the artifact. This meaning can then be used to explain particular developmental paths. Typical groups might include engineers, advertisers, consumers, and so on. Such groups are not static; newly emergent groups can also be identified. Although relevant social groups share a meaning of the artifact, they may of course share other properties of family resemblance, which also give them their group characteristic.[7] Thus, some women users of bicycles who

[5]Susan J. Douglas, *Inventing American Broadcasting, 1899–1922* (Baltimore, 1987); Claude S. Fischer, *America Calling: A Social History of the Telephone to 1940* (Berkeley, 1992); Michele Martin, *"Hello Central?" Gender, Technology and Culture in the Formation of Telephone Systems* (Montreal, 1991); and David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880–1940* (Cambridge, Mass., 1990). Another example is the unexpected use of interactive terminals by users in the development of the French videotext system, Minitel (see Volker Schneider, Graham Thomas, Thieny Vedel, Jean Marie Charon and Ian Miles, "Pathways to Telematics: The Politics of Videotext in Britain, France and the Federal Republic of Germany" [Cologne, 1989; unpublished manuscript, copy in authors' possession]).

[6]Trevor Pinch and Wiebe Bijker, "The Social Construction of Facts and Artifacts," *Social Studies of Science* 14 (1984): 399–441.

[7]Wiebe Bijker, *Of Bicycles, Bakelite, and Bulbs: Towards a Theory of Sociotechnical Change* (Cambridge, Mass., 1995), has introduced the notion of a "technological frame" to understand how individuals may deviate from the shared group meaning.

shared the meaning of the high-wheeler as an "unsafe machine" also shared the family resemblance that they were women.[8] SCOT emphasizes the "interpretative flexibility" of an artifact. Different social groups associate different meanings with artifacts leading to interpretative flexibility appearing over the artifact. The same artifact can mean different things to different social groups of users. For young men riding the bicycle for sporting purposes the high-wheeler meant the "macho machine" as opposed to the meaning given to it by women and elderly men who wanted to use the bike for transport. For this latter group, as already mentioned, the high-wheeler was the "unsafe machine" (because of its habit of throwing people over the handle bars—known as "doing a header"). Such meanings can get embedded in new artifacts, and developmental paths can be traced which reinforce this meaning (e.g., placing even larger wheels on bicycles to enable them to go even faster). Interpretative flexibility, however, does not continue forever. "Closure" and stabilization occur, such that some artifacts appear to have fewer problems and become increasingly the dominant form of the technology. This, it should be noted, may not result in all rivals vanishing, and often two very different technologies can exist side by side (for example, jet planes and propeller planes). Also this process of closure and stabilization need not be final. New problems can emerge and interpretative flexibility may reappear.

"Interpretative flexibility" distinguishes SCOT from other social constructivist approaches in the history of technology. SCOT underscores artifacts and their working particularly as subject to radically different interpretations that are coextensive with social groups. This goes beyond saying that technology is merely embedded in human affairs. SCOT focuses attention upon what counts as a viable working artifact, and what indeed counts as a satisfactory test of that artifact. Various case studies have shown how social groups have contested workability and test results.[9] Such studies point to the dangers

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Often one individual can partake in a number of different technological frames and can be weakly included in some frames and strongly included in others.

[8]Langdon Winner, "Upon Opening the Black Box and Finding It Empty: Social Constructivism and the Philosophy of Technology," *Science, Technology, and Human Values* 18 (1993): 362–78, has criticized SCOT for an overly restrictive definition of a social group and for ignoring "irrelevant" social groups. It is the possibility that groups share more than one family resemblance, which enables historians using SCOT to focus upon excluded or marginalized groups. Thus, on a priori grounds one might expect certain groups to be marginalized, e. g., women, African Americans, etc. Using this family resemblance property historians can analyze these neglected groups within the SCOT framework.

[9]See for instance, Donald MacKenzie, "From Kwajalein to Armageddon? Testing and the Social Construction of Missile Accuracy," in *The Uses of Experiment*, ed. David

of the analyst assuming a taken-for-granted bedrock of a technical realm that sets the meaning of an artifact for all spaces, times, and communities.

Although SCOT has been refined and developed over the last decade, important weaknesses have appeared.[10] First, SCOT as originally conceived dealt mainly with the design stage of technologies.[11] The notion of closure was a little too rigid. What was missing was a sense of how and in what circumstances the "black box" of technology could be reopened as it was taken up by different social groups.[12] Second, SCOT, as many commentators have remarked, said little about the social structure and power relationships within which technological development takes place.[13] A related concern is the neglect of the reciprocal relationship between artifacts and social groups. We agree that it is important to show not only how social groups shape technology, but also how the identities of social groups are reconstituted in the process.

Here we address these weaknesses in two specific ways. First, by looking at the adaptation of the motor car among farm people in the United States we will explore how interpretative flexibility of an artifact can reappear at the use stage of a technology. Second, we will start to map out the relationships between social groups and their ability to shape the development of an artifact and how they in turn get shaped in using it. We shall do this in particular by a close consideration of the gender relationships between different social groups.

Feminist scholars and others have long recognized gender rela-

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Gooding, Trevor Pinch, and Simon Schaffer (Cambridge, 1989), pp. 409–35; Pinch, " 'Testing, One, Two, Three . . . Testing': Towards a Sociology of Testing," *Science Technology, and Human Values* 18 (1993): 25–41.

[10]For example, Boelie Elzen, "Two Ultracentrifuges: A Comparative Study of the Social Construction of Artifacts," *Social Studies of Science* 16 (1986): 621–62; Thomas Misa, "Controversy and Closure in Technological Change: Constructing 'Steel,' " in *Shaping Technology/Building Society: Studies in Sociotechnical Change*, ed. Wiebe Bijker and John Law (Cambridge, Mass., 1992), pp. 109–39.

[11]H. Mackay and Gareth Gillespie, "Extending the Social Shaping of Technology Approach: Ideology and Appropriation," *Social Studies of Science* 22 (1992): 685–716.

[12]It is important to realize how the term "black box" is being used here. A technology that is black-boxed is one where design has stabilized. This does not mean it has literally to be treated as a black box, meaning that the inner workings are opaque to the user (although this may happen for some technologies and some users). Thus the Model T was a stabilized black box which was designed in such a way that it could easily be repaired.

[13]Stewart Russel, "The Social Construction of Artifacts: A Response to Pinch and Bijker," *Social Studies of Science* 16 (1986): 331–46; Trevor J. Pinch and Wiebe E. Bijker, "Science Relativism and the New Sociology of Technology: Reply to Russel," *Social Studies of Science* 16 (1986): 347–60.

tions as a primary manifestation of power relationships among social groups. Although Judy Wajcman has criticized SCOT for neglecting this relationship by failing to recognize that the virtual absence and weak influence of female social groups leads to the construction of technology as a "masculine culture," gender analysis has not been entirely absent from SCOT. Pinch and Bijker's study of the bicycle treated gender as a characteristic that defined two significant social groups, young male speedsters and women riders, and explained their opposing interpretations of the bicycle in terms of their gender. In this article we will extend that analysis by examining more closely how gender relations between social groups helped shape a stabilized artifact and how these relationships were, in turn, reinforced in the process. Drawing upon the work of Cynthia Cockburn and Judy Wajcman, we will use Sandra Harding's categories of gender structure, gender identity, and gender symbolism to analyze the various forms of gender meanings involved in the social construction of the automobile in the rural United States.[14]

Interpretative Flexibility Revisited—The Anticar Crusade

The first motor cars, like the bicycle before them, made a dramatic impression on rural American life. When they first appeared in the countryside in the early years of this century, driven by rich city folk out for a spin, they often met a hostile reception. Indeed, farmers joined small-town residents, suburbanites, and even irate city dwellers in many parts of the country in hurling such epithets as "red devil" and "devil wagon" at the dangerous, speeding car—names that soon symbolized the rising clamor of rural protest.[15] Motorists and automobile journals countered with the traditional antirural insults of "hayseed" and "rube," but also coined such new phrases as "autophobe" and "motorphobe" for all critics of the car—

[14] Judy Wajcman, *Feminism Confronts Technology* (University Park, Penn., 1990); Cynthia Cockburn, *Machinery of Dominance: Women, Men and Technical Know-how* (London, 1985), and *Gender and Technology in the Making* (London, 1993); Sandra Harding, *The Science Question in Feminism* (Ithaca, NY, 1986).

[15] Berger (n. 2 above, ch. 1) describes anticar sentiment well, but does not discuss the origin and use of the phrase "devil wagon" except to quote its usage in rural Colorado in 1903 (p. 14). For examples of social groups using that phrase and similar ones, like "red devils," see *Chicago Tribune*, August 17, 1902, p. 39 (national); *Motor World*, July 3, 1902, p. 404 (Long Island, New York), July 24, 1902, p. 493 (Pennsylvania), August 14, 1902, p. 567 (Glencoe, Illinois), and February 12, 1903, p. 725 (Connecticut); *Rural New Yorker*, June 10, 1905, p. 460 (New York); *Independent*, September 27, 1906, p. 762 (national); Mitford A. Matthews, ed., *A Dictionary of Americanisms on Historical Principles* (Chicago, 1951); and Fischer (n. 5 above) p. 138. On the anticar movement in the city, see McShane (n. 1 above).

whether they lived in the city, town, or country. A group in St. Louis even defied the widespread opposition to "scorchers" in 1905 by calling themselves the Red Devil Automobile Club.[16]

The main antagonism between farmers and the early car and its drivers seems to have stemmed from the dramatic effects that the car had upon livestock. Horses reared at the car's noisy approach, often breaking away or upsetting buggies; chickens crossed the road for the last time. One confused ram even charged a car that had stopped to fix a flat, hitting a front tire head-on. "The shock knocked the Ford off the jack and bounced the ram back on his haunches," recalled the surprised driver. "A look which combined amazement and increased animosity showed in [the ram's] eyes and he wasted no time in sighting for a second assault. His hurry made his aim even poorer and his head struck the front axle with terrific force," breaking the ram's neck. Its owner did not ask for compensation—after all, the ram hit the car!—but many drivers paid handsomely when they killed farm animals on country roads.[17]

Many farm women complained that recklessly driven autos prevented them from driving their horse-drawn buggies on country roads. A New York woman told a newspaper in 1904 that "we farmers' wives and daughters think that the people who are able to own and run an automobile are able to build their own roads to run them on, and leave the public highways for the use of people who do not care to be sent from this mundane sphere by a horse maddened by one of those 'pesky' automobiles." A Maine woman said in 1909 that country roads were impassable for six months of the year and that farm women dared not drive their buggies during the other half "because of automobiles." As late as 1915, a survey of the wives of more than two thousand crop correspondents for the U.S. Department of Agriculture reported that "according to several communications the increase in automobiles has made it hazardous or dangerous for women to do much driving on many country roads." The report published criticisms of automobile drivers by rural women in Vermont, New York, Illinois, Wisconsin, South Carolina, West Virginia, and Mississippi.[18]

[16] See, e.g., *Motor World*, February 9, 1905, pp. 968, 969 (hayseed); *Rural New Yorker*, August 13, 1904, p. 607 (rube); *Motor World*, May 9, 1902 (autophobe), and *Motor Age*, June 17, 1907, pp. 94–95 (motorphobe). Even in the last article, entitled "Farmers Not All Motorphobes," which was intended to promote the rural market to car dealers, the author referred to the interurban railway as the "Great Inter-Reuben Railway" (p. 94). On the St. Louis group, see *Motor World*, November 16, 1905, p. 383.

[17] Quoted in Berger, p. 21.

[18] *Rural New Yorker*, July 23, 1904, p. 565; A Farmer's Wife, "The Child on the Farm," *Outlook* 91 (April 10, 1909): 832–33, on p. 833; and United States Depart-

Even the goggles and dusters worn by early motorists while touring in open cars appeared monstrous to some farm people. *Motor Age* reported in 1904 that during a "century run" in Utah a motoring party saw a farm couple and their seven children picking berries along the road. "The motorists stopped and the driver and another from the party started towards the group of busy pickers. They heard him approach, and, as he wore goggles, they were so frightened they ran back to the farm house screaming. The party had to continue the trip without berries."[19]

The early car was expensive, unreliable, and certainly not quiet. An Indiana woman recalled that she always knew when to get ready to meet her boyfriend for a date because she could hear him start his car on the next farm a quarter of a mile away.[20] Apart from the car's speed, many country folk were unimpressed with it as a means of transportation. It was a common sight to see farmers with their horses towing a car that had broken down or pulling a car out of muddy country roads—a source of income for some farmers and of moral satisfaction to those who despised the "devil wagon."[21] Adding to the antagonism were the types of car drivers—urban, upper class—the farmers encountered. Another, later, source of criticism was the damage which the cars were thought capable of inflicting on the fabric of rural life. Farm people had built up a whole network of crucial institutions such as schools and churches based upon the transport system of the horse and buggy. The car with its much longer range threatened such institutions. Children could go to consolidated schools further away, other churches than the local one came within range. Worse, with the option of visiting friends or family in a nearby town for the day, or the other temptations which such a visit offered, why go to church at all?[22]

The early antagonism was such that rural people resorted to both legal and illegal means to stop the influx of cars. Counties in West Virginia and Pennsylvania passed laws that banned autos; Vermont

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ment of Agriculture (USDA), Office of the Secretary, *Social and Labor Needs of Farm Women* (Washington, DC, 1915), pp. 66–72, on p. 66. See also Albert Clough, "Nervous Strains Due to Automobile Driving," *Horseless Age*, September 23, 1903, pp. 323–25, on p. 324.

[19] "Met Queer People," *Motor Age*, July 14, 1904, p. 14.

[20] Eleanor Arnold, ed., *Buggies and Bad Times: Memories of Hoosier Homemakers* (Indianapolis, 1983), p. 35.

[21] *Motor Age*, September 9, 1915, p. 15; Berger (n. 2 above), pp. 13–14, 30, 88–90; and Flink, *Automobile Age* (n. 1 above), pp. 101, 169–70.

[22] F. G. Moorhead, "Automobile Versus Country Church," *Technical World Magazine* 18 (November 1912): 298–300; Berger, chs. 5–6; and Wik (n. 2 above), pp. 31–32. Unlike Berger, Wik says the car actually increased church attendance.

required a person to carry a red flag and walk ahead of the car. A flurry of legislation around 1908 required cars to slow down for horse-drawn vehicles, or stop if the horse appeared frightened. Lucrative "speed traps" also date from this period. Legislatures withheld support from road improvement schemes. The threat was perceived to be such that, as in the case of the bicycle, many farmers took the law into their own hands. The press reported numerous cases of farm men attacking motorists from 1902 to 1907, a period of widespread auto touring. Farmers shot a chauffeur in the back in Minnesota, stoned a motorist in Indiana, shot at a car passing a horse-drawn buggy in South Carolina, and assaulted a chauffeur in Wisconsin. New York farmers hit a motorist with a galvanized iron pail on Long Island, pushed a lawn mower into an auto's path, whipped a motorist for no apparent reason, and delayed a hill-climbing contest near Rochester by fighting with onlookers.[23]

Farm men took these actions partly because they viewed country roads, which they built and maintained, in a proprietary manner. Yet many of them detested the "devil wagon" so much that they sabotaged their own roads to try and stop the growing menace. In 1905, Connecticut farmers spread a tire-cutting slag on roads (supposedly to fill in ruts!), and Minnesota farmers plowed up roads near Rochester. As late as 1909, Indiana farmers, tired of being awakened by revellers returning from a night of drinking in nearby roadhouses, weakened bridges and barricaded roads. In the same year, farmers near Sacramento, California, dug ditches across several roads and caught thirteen autos in their traps. Rural people booby-trapped other roads with an innovative assortment of rakes, saws, glass, tacks, and ropes or barbed wire strung across the road.[24] Groups such as the Farmers' Anti-Automobile League near Evanston, Illinois, the Anti-Automobile Club of Grover, Missouri, and the Farmers' Protective Association in Harrison Township, Ohio, were formed to organize rural opposition to the car. The Illinois league

[23]Berger, pp. 24–28; Wik, p. 17; *Motor World*, December 24, 1903, p. 466, June 22, 1905, p. 569, September 28, 1905, p. 38, and October 24, 1907, p. 184a; *Motor Age*, July 7, 1904, p. 21. Although farm men and women eagerly adopted the telephone (and later the automobile), their early resistance to the car is similar to their distrust of "book farming" and home economics methods imposed by agrarian modernizers. See Fischer (n. 5 above), pp. 92–107, and David Danbom, *The Resisted Revolution: Urban America and the Industrialization of Agriculture, 1900–1930* (Ames, Iowa, 1979).

[24]Flink, *America Adopts the Automobile* (n. 1 above), pp. 67–68; Wik, p. 17; *Motor World*, April 27, 1905, p. 211 and November 30, 1905, p. 478; *Motor Age*, July 30, 1908, p. 29; *Wilkes (North Carolina) Chronicle*, July 14, 1909, reprinting an Indiana story. We thank Scott Crawford for the last citation.

had a twenty-member vigilante committee to mete out justice to reckless drivers.[25]

In terms of SCOT we can say that these actions, termed an "anti-auto crusade" by one historian, showed the existence of an important relevant social group.[26] For them the car was not the fond object of joy later encapsulated in such names as the "flivver" (so called apparently because the vibration of the car was considered to be good for the liver) or the "Tin Lizzie" (another nickname for the Model T)—it was the "devil wagon." Did this meaning of the car for this social group lead to a radical interpretative flexibility? The answer must be yes. By attempting to destroy cars directly and make roads impassable to cars, this social group was trying to affect perhaps in the most dramatic, direct way possible the development of the artifact. If they had succeeded the car might have taken a very different form—it would have been a short distance city vehicle only. Railroads would have remained the main form of transportation to rural areas—modern America would look very different.

The anticar movement failed because of a combination of circumstances. Faced with the saturation of the urban luxury car market, manufacturers developed a large rural market by producing more affordable cars designed to navigate country roads. The inexpensive Model T, to take the most successful example, sat high off the ground (also making repair easier) and had a high horsepower-to-weight ratio and a three-point suspension. The introduction of the Model T in late 1908 also came at a time of growing support for the car among farm leaders. The National Grange had passed a resolution that summer stating that the "motor vehicle is a permanent feature of modern life" and had a right to use rural roads. The Grange followed the lead of the influential Midwestern paper, *Wallace's Farmer*, which had begun to promote the gasoline automobile

[25] *Motor World*, August 13, 1903, p. 753; June 1, 1905, p. 430; May 10, 1906, p. 786.

[26] Wik, p. 16. Wik cautions readers that "it is a gross misconception, however, to assume all rural people fought the introduction of the automobile" (p. 19), yet he notes a "stubborn resistance to the early automobiles by a large segment of the population" (p. 14). Flink, in *America Adopts the Automobile*, pp. 66–70, and *Car Culture* (n. 1 above), pp. 27–28, argues that rural opposition to the auto was localized, confined to the years 1904 (the beginning of widespread auto touring) to 1906 (the rise of auto sales to farmers), and directed against motoring, rather than the car. But his citations of antimotoring sentiment and actions in Minnesota, Ohio, Indiana, New Jersey, and Missouri tend to undermine this argument (*America Adopts the Automobile*, pp. 67–68, 140). Like Flink, we have found no evidence of national leadership of these actions against the auto, but the presence of both unorganized and organized resistance in several states throughout the country for nearly a decade indicates that it was a widespread phenomenon.

in January 1908 using the same methods it employed for any new technology it favored: advertisements, editorials, articles, and requests for readers' experiences. The paper's editor stated in February that "farmers have had their fun—and sometimes it was not fun, either—with the users of the automobile." Although farm people had justifiably "called it the rich man's plaything" and had sworn at it for disrupting rural life, they had begun to value cars and to buy them for themselves. The *Rural New Yorker*, a former critic of the automobile, started to promote it in 1909. *Wallace's Farmer* thought highly of two types of cars: the technologically out-of-date but inexpensive buggy car, whose high wheels cleared the hump in rutted country roads; and a touring car with a removable tonneau (backseat) that could be easily converted into a small truck (fig. 1). Manufacturers of both types flourished for a brief time, thus helping to introduce the automobile into the countryside.[27] Roads were also improved. Gradually, the advantages of the car became all too clear-cut. The car promised to end the relative isolation of farm life. And the possible income to be derived from wealthy city people did not go unnoticed. Tourism thrived, as did repair shops. Farm men, many of whom had operated steam engines and stationary gasoline engines, were well-placed to become car users. As buggy cars, convertibles, and the Model T spread into rural areas, the anticar movement vanished. By 1920, in fact, the U.S. Census reported that a larger percentage of farm households owned an automobile than did nonfarm households (30 percent to 24 percent).[28] Thus the radical meaning of car as "devil wagon" did not stabilize.

Interpretative Flexibility in the Farm Yard

The main social groups of relevance to understanding the development of the rural car are manufacturers, farm men, and farm women.[29] In studying a technology which had already stabilized in

[27] *Proceedings of the National Grange*, 1908, p. 18. *Wallace's Farmer*, December 20, 1907, p. 1514; January 3, 1908, p. 6; February 14, 1908, pp. 215 (quotation), 245; September 25, 1908, p. 1171. *Rural New Yorker*, August 13, 1904, p. 614; December 12, 1908, p. 958; and November 6, 1909, p. 961.

[28] Berger (n. 2 above), pp. 35–40, 47–51; Wik (n. 2 above), pp. 19–33; Flink, *America Adopts the Automobile*, pp. 69–73, 82–85, 111 and *Car Culture* (n. 1 above), pp. 35, 53; Warren J. Belasco, *Americans on the Road: From Auto Camp to Motel, 1910–1945* (Cambridge, Mass., 1979), pp. 125–142; Peter J. Hugill, "Good Roads and the Automobile in the United States, 1880–1929," *Geographical Review* 72 (1982): 327–49; and Fischer (n. 5 above), p. 102 (auto statistics).

[29] Although other social groups are significant, such as home-demonstration agents and agricultural engineers, for our purposes here we will concentrate on these three groups only and the emergent new social group of car dealers.

FIG. 1.—Advertisement for a Moline automobile, which could be converted to a "truck" by removing the tonneau. (*Wallace's Farmer*, January 14, 1910, p. 54.)

regard to its fundamental design—by 1909 the "large, front-engined, rear-drive automobile" of system Panhard—it is clear that one social group initially had more influence than any other in terms of giving a meaning to the artifact: the manufacturers.[30] Because they produced the car, the automobile manufacturers exerted great in-

[30] Peter J. Hugill, "Technology Diffusion in the World Automobile Industry, 1885–1985," in *The Transfer and Transformation of Ideas and Material Culture*, ed. Peter J. Hugill and D. Bruce Dickson (College Station, Texas, 1988), pp. 110–42. A further period of stabilization occurred in the mid-1920s with the advent of electric starters, closed bodies, and all-steel bodies; see Flink, *Automobile Age*, pp. 212–14.

fluence on the form the technology initially took. But their position, although influential, was not overwhelmingly so. New manufacturers could (and did) produce new and different cars with different users in mind. Furthermore, although manufacturers may have ascribed a particular meaning to the artifact they were not able to control how that artifact was used once it got into the hands of the users. Users precisely as users can embed new meanings into the technology.

This happened with the adaptation of the car into rural life. As early as 1903, farm families started to define the car as more than a transportation device. In particular, they saw it as a general source of power. George Schmidt, a Kansas farmer, advised readers of the *Rural New Yorker* in 1903 "to block up the hind axle and run a belt over the one wheel of the automobile and around the wheel on a [corn] sheller, grinder, saw, pump, or any other machine that the engine is capable of running, and see how the farmer can save money and be in style with any city man." T. A. Pottinger, an Illinois farm man, wrote *Wallace's Farmer* in 1909 that the ideal farm car should have a detachable backseat, which could turn the vehicle into a small truck, and that it should be able to provide "light power, such as running a corn sheller, an ensilage cutter, or doing light grinding."[31] The car was also used for domestic work, such as powering washing machines, which seems to have been a source of some humor. One suburban commentator in musing about the impact of the car on his family life in 1910 described his car falling off the jack and careering away across the backyard out of control dragging the washing machine (and the luckless domestic servant) with it.[32] The photograph in figure 2, taken in the 1930s, shows a dramatic instance of this sort of use. Here a farm man has jacked up a Model T in the farmyard to provide power to operate a washing machine. Although the car was sometimes used to assist in traditional "women's work" (e.g. running the butter churn and cream separator), farm men—rather than farm women—more commonly used the car to provide stationary power, and mainly for "men's work"—that is, to run agricultural machinery. Corn shellers, water pumps, hay balers, fodder and ensilage cutters, wood saws, hay and grain hoists, cider presses, and corn grinders were all powered by the auto. A

[31] *Rural New Yorker*, June 27, 1903, p. 467; *Wallace's Farmer*, January 8, 1909, p. 53. For other early examples, see *Rural New Yorker*, August 27, 1903, p. 595 (corn sheller) and *Motor World*, March 3, 1904, p. 1005 (sawing wood).

[32] Ellis Parker Butler, "The Adventures of a Suburbanite, V—My Domesticated Automobile," *Country Life*, 17 (February 1910): 417–19.

FIG. 2.—Kansas farmer Bill Ott with Lizzie Ott and car-powered washing machine, c. 1930. (Courtesy of Bill and Ruth Dick, Newton, Kansas; collection of Ronald Kline.)

rancher even used a Cadillac to shear his sheep.[33] A Maine farm man put a car to so many multiple usages in 1915 that tax assessors did not know whether they should classify the car as a pleasure vehicle or a piece of agricultural machinery.[34] In addition to providing a stationary source of power, cars found a wide variety of unexpected uses in their mobile form. Farm men used them as snowmobiles, tractors, and agricultural transport vehicles. Indeed, it seems from the earliest days of the car's introduction onto farms that farmers were acutely aware of its potential, whether simply to transport fodder or to power a feed chopper.[35] Adapting the auto to the myriad tasks of farm life was common enough practice that seven of twenty-

[33] Roger B. Whitman, "The Automobile in New Roles," *Country Life* 15 (November 1908): 53; "Ford's Versatile Flivver," *Horseless Carriage Gazette* 21 (January–February 1959): 8–19; Wik (n. 2 above), pp. 32–33; Berger (n. 2 above), pp. 40–43; Flink, *America Adopts the Automobile* (n. 1 above), p. 93. Interestingly, one of the few urban/industrial examples which parallels the rural case was the use of cars as an alternative source of power during industrial disputes. The Locke Machine works in Detroit apparently used two jacked-up Ford motor cars to power their entire works during a coal strike; see *Motor Age*, December 18, 1919, pp. 20–21. Another urban usage was powering hoists in building works. See *Scientific American* 97 (November 9, 1907): 332.

[34] *Rural New Yorker*, May 29, 1915, p. 751; and "When is a Motor Car Not a Motor Car? Assessors Ask," *Motor Age*, June 3, 1915, p. 29.

[35] Whitman, p. 53; "The Farmer and the Automobile," *Country Life* 15 (April 1909): 636; Walter Langsford, "What the Motor Vehicle Is Doing for the Farm," *Scientific American* 102 (January 15, 1910): 50–51; George E. Walsh, "Farming with Automobiles," *Review of Reviews* 43 (January 1911): 62–67; Charles M. Harger, "Automobiles for Country Use," *Independent* 70 (June 1, 1911): 1207–1211; "How Farmers Use their Cars," *Rural New Yorker* July 24, 1915, p. 935.

three New York farm families who participated in a recent oral history project recalled that they or their neighbors had used the car as a hay rake, pickup truck, or power source. One farm man, eighty-eight-year-old Winfred Arnold, remembered that his neighbors used the car to power jobs around the farm, but he himself could afford to use stationary gasoline engines.[36]

In these instances, rural users of the car have reintroduced what we would call interpretative flexibility, but unlike in the original SCOT model this flexibility was not at the design stage. New meanings are being given to the car by the new emerging social group of users—in this case, technically competent farm men. To the urban user the car meant transport. For the rural users we have identified, the car, as well as being a form of transport, could be a farm tool, a stationary source of power, part of a domestic technology, or perhaps all of these.

Gendering the Car

The remarkable interpretative flexibility of the rural car has a strong tie to the *structure* of gender relations between farm men and women. Most generalizations about social groups as large and culturally diverse as farm men and farm women are highly problematic, but gender relationships on farms during this period appear to have been fairly stable.[37] As head of both farm and family in the 19th century, men were in a position to control the productive and reproductive labor necessary to sustain a large family and, increasingly, to farm on a commercial basis. By the turn of the century, farm women appear to have gained more control over their public and domestic lives as gender relations changed with "modernization," but many traditional sexual divisions of labor remained. On most family farms, men (husband, sons, and hired hands) performed what were regarded as the main income-producing activities in the field, barn, and machine shop; women (wife, daughters, and hired help) performed "supportive" tasks (from both men's and women's points

[36] Suzanne Moon, oral history interviews with Winfred Arnold, November 28, 1994; Gerald Cornell, May 24, 1995; Jessie Hamilton, February 11, 1995; Leroy Harris, April 4, 1995; Owen and Kathleen Howarth, January 24, 1995; Stanley and Albina Konchar, December 16, 1994; and Thena Whitehead, February 11, 1995. Tapes and transcripts of these and other oral history interviews conducted by Suzanne Moon and referred to in this article are in the possession of Ronald Kline.

[37] Again we would stress that the analysis in terms of social groups is not meant to preclude subdivisions being found within groups. The important point to keep in mind is that members of a social group share a particular meaning of a technology. That shared meaning will take more the form of a Wittgensteinian "family resemblance" than an exact template.

of view) in the house, garden, and poultry shed. Men and women often shared tasks in the dairy. Although many farm women worked in the field at harvest time and at other periods of labor shortages, they usually viewed this economic function, as well as their income from selling vegetables, eggs, and dairy products, in terms of "helping out" the man in the field so that the farmstead could stand on its feet economically. For the same reason, women before World War II seem to have accepted the mechanization of "men's" jobs in the field before the mechanization of "their" work in the house, but not without some protest.[38]

Within this flexible and historically variable gender *structure* were gender *identities* among farm men and women that help explain the social construction of the rural automobile.[39] Many farm men, especially in the Midwest, saw themselves as proficient mechanics who could operate, maintain, repair, and redesign most machines on the farm, from steam engines and threshers in the field to water pumps in the kitchen.[40] Although the social construction of masculinity has varied historically, competence in the operation and repair of machinery formed a defining element of masculinity (and thus gender identity) for many male groups in this period, including linotype operators, other craftsmen, small entrepreneurs, and farm men.[41] Women might pump water, drive the horse and buggy to town, and occasionally operate field machinery, but men fixed a leaky pump, oiled and greased the buggy, and redesigned a hay binder to work over hilly ground. Technical competence helped to define their gender position as a form of masculinity and reinforced the rural gender system.

Consequently, the gasoline automobile, which was already *symboli-*

[38]John Mack Faragher, "History from the Inside-Out: Writing the History of Women in Rural America," *American Quarterly* 33 (1981): 537–57; Corlann Gee Bush, "'He Isn't Half So Cranky as He Used to Be': Agricultural Mechanization, Comparable Worth, and the Changing Farm Family," in *"To Toil the Livelong Day": American Women at Work, 1780–1980*, ed. Carol Groneman and Mary Beth Norton (Ithaca, 1987), pp. 213–29; Nancy G. Osterud, *Bonds of Community: The Lives of Farm Women in Nineteenth-Century New York* (Ithaca, 1991); Deborah J. Fink, *Agrarian Women: Wives and Mothers in Rural Nebraska, 1880–1940* (Chapel Hill, 1992); Katherine Jellison, *Entitled to Power: Farm Women and Technology, 1913–1963* (Chapel Hill, 1993); and Mary Neth, *Preserving the Family Farm: Women, Community, and the Foundations of Agribusiness in the Midwest, 1900–1940* (Baltimore, 1995).

[39]These gender identities were not, of course, predetermined, they were flexibly negotiated.

[40]Reynold M. Wik, *Steam Power on the American Farm* (Philadelphia, 1953).

[41]Cockburn (n. 15 above); Wajcman (n. 15 above), pp. 38–40, 141–46; and McShane (n. 1 above), p. 155.

cally inscribed for masculine use by Henry Ford and other manufacturers, came onto farmsteads headed, in general, by men partly because of their technical competence.[42] Farm people usually viewed the early car as the latest highly sophisticated piece of farm machinery—and it generally became the province of men. Male and female access to the driver's seat varied widely in farm families. At one extreme, some women drove the car to the exclusion of men. Alice Guyer, an Indiana farm woman, recalled that her father "had trouble with them, and he just gave up the driving to my older sister." Bertha Pampel remembered that "my dad never did drive. My mother did all the driving." At the other extreme, some farm women who had been proficient with the horse and buggy never mastered the car and thus became more dependent on men and less technically competent. Laura Drake, another Indiana farm woman, recalled that her family had a car when she was growing up, "but we weren't allowed to touch it. Nobody touched that [car] but him [her father]." At least two of the twenty-three farm families interviewed recently in New York said that a mother or daughter did not learn to drive.[43]

A motor-wise farm woman was rare enough to be news. A New York woman told a reporter in 1915 that she was "thoroughly familiar with the machine," and then proceeded to fix a flat tire by vulcanizing it. In general, however, farm journals and oral histories indicate that farm men, rather than farm women, maintained, repaired, and tinkered with the new addition to the farmstead, especially because repair facilities were few and far between in this period. Although the average farm man was probably not an expert auto mechanic, most observers thought farm men could maintain and repair cars better than city men.[44] The farm man's technical competence,

[42] McShane, p. 163; Scharff (n. 1 above), pp. 52–55. McShane notes that women purchasers of automobiles in Maryland and New Hampshire avoided the Model T, which had a reputation as a man's car because of the physical strength required to steer and shift it and because of the lack of amenities like a front door on the driver's side.

[43] Eleanor Arnold (n. 21 above), pp. 30–44, quotations on pp. 40, 41; Suzanne Moon, oral history interviews with Sylvia Schrumpf, January 24, 1995, and Eva Watson, February 21, 1995 (see n. 36). According to some accounts, farm daughters drove as much as their brothers; see Harger (n. 36 above), p. 1210; "The New Car," *Rural New Yorker*, October 7, 1916, p. 1296; and Eleanor Arnold, p. 42.

[44] "The Auto on the Farm," *Literary Digest*, October 9, 1915, p. 770 (quotation); Wik, *Henry Ford* (n. 2 above), ch. 4. On the need to educate farm men in auto mechanics, see Editor, "Educating the Farmer-Motorist," *Motor Age*, March 18, 1915, p. 12, and Editor, "The Farmer and the Auto," *Independent* 73 (November 7, 1912): 1091–1092. For views of farm men as more technically competent with cars than city men, see "Farmer, Accustomed to Machinery, Can 'Use' Auto," *Ford Times*, July

rooted in his masculine identity, enabled him to reopen the black box of the car (by reinterpreting its function), jack up its rear wheels, and power all kinds of "men's" work on the farm and, less frequently, the "woman's" cream separator, water pump, or washing machine. This version of the gendered division of labor on the farm—in which men maintained agricultural machinery (including cars) and women performed household tasks—could not be more strikingly illustrated than in the photograph in figure 2, where the man has jacked up the car but the woman (his daughter) still operates the washing machine. Our evidence overwhelmingly shows that farm men, not farm women, reconfigured the car in order to use it in an alternative manner. We have found only one exception—that of an independent woman farmer who used her car to pull a hay rake in 1918.[45]

Farm men also converted the car from a passenger vehicle to a produce truck. Showing off further, they returned the car to its original configuration, as defined by the manufacturer, and either drove family members to town and church, or handed it over, in this more symbolically feminine form of usage, to women to operate—sometimes to go to town to get parts to repair field machinery.[46]

The mutual interactions between the artifact, social groups, and intergroup power relations are clearly evident in this case. The gender identity of farm men, formed by defining it in contrast to the constructed femininity of farm women, enabled men to interpret the car flexibly and to socially construct it as a stationary power source. This social construction, in turn, reinforced technical competence as masculine, thus reinforcing farm men's gender identity vis-a-vis farm women. Thus gender not only shaped the motor car, but gender identities were also themselves in turn shaped by the motor car.

How did farm women fare in this process? The evidence is not clear on this point. Some historians maintain that farm women gained independence by using the car to extend their sphere of influence and redefine their gender roles. By marketing their products more widely, they gained more economic power at home, and by

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15, 1908, p. 133, Ford Motor Company Archives, Henry Ford Museum and Greenfield Village, Dearborn, Michigan (FMCA), Acc. 972; H. R. Harper, "The Automobile in the Farming Districts," *Ford Times*, December 1, 1908, pp. 6, 8; Harger, p. 1208; and "Farmers as Prospects," *Ford Times*, February 7, 1914, p. 183. Farm men also sent in tips to farm journals about the care of cars; see *Wallace's Farmer*, December 31, 1915, p. 1728; *Rural New Yorker*, January 11, 1919, p. 66.

[45] *Rural New Yorker*, September 21, 1918, p. 1089.

[46] See, e.g., *Motor Age*, July 2, 1908, p. 11.

using the car to visit friends and relatives, they were not tied so closely to the farmstead.[47] Many contemporaries professed this view, especially such "modernizers" as home economists, editors of farm journals, and auto manufacturers who publicly espoused a Country Life ideology of saving the supposedly overworked farm woman.[48] Many farm women praised the automobile. In response to muckraking concerns about the overworked farm woman, Mrs. Arthur Hewins in Massachusetts wrote in 1920 that the car reduced her workload. "In our 'Lizzie' I carry the milk three miles to the creamery every morning, Sundays included . . . I have time to go for pleasure rides, and once or twice a week we go to the 'movies' in the nearest town, which is nine miles away."[49]

Other historians argue that farm women travelled further, but stayed within their traditional, supportive gender roles when they shopped for domestic goods or went to town in an emergency to buy parts to fix the tractor. In this argument, using the car reinforced rural gender roles, as it had for suburban women.[50] Does farm women's use of the car support historian Ruth Cowan's thesis of household technology leading to "more work for mother?" Did the use of the car by full-time homeworkers on the farm tend to save the work of their helpers, promote a higher standard of living, and restructure work patterns, as it had for their sisters in the city and suburbs? We note first of all that the time-use studies that help support Cowan's thesis apply to farm women (in fact, the home economists who conducted the pre-1945 studies focussed on the "problem" of the overworked farm women). But these studies provide much more information about time spent on household work than on using the automobile, and the farm women surveyed were probably atypically well-to-do and had adopted the urban domestic ideal

[47] See, e.g., Berger (n. 2 above), ch 2; Scharff, pp. 142–45.

[48] See, e.g., Florence E. Ward, "The Farm Woman's Problems," *Journal of Home Economics* 12 (1920): 437–57; *Wallace's Farmer*, January 7, 1910, p. 29, and September 9, 1910, p. 1179.

[49] "Farm Women Who Count Themselves Blest by Fate," *Literary Digest* November 13, 1920, pp. 52–53, quotation on p. 52. For other examples, see "Women and Present-day Problems," *Progressive Farmer*, October 16, 1920, p. 1679; Frances Gilbert Ingersoll to the Editor, *Rural New Yorker*, March 14, 1925, p. 482.

[50] Jellison (n. 39 above), pp. 122–24; Neth (n. 39 above), pp. 246–47. Neth takes a position similar to that of Fischer for the telephone, and argues on the basis of oral histories that farm people often used the car to "enhance the social ties that shaped their lives, rather than to alter them." For these women, the "automobile became a new tool for building rural neighborhoods in traditional ways." On the auto and suburban women, see Cowan, *More Work for Mother* (n. 4 above), pp. 82–85, 173–74; and Wajcman (n. 15 above), pp. 129–31.

to a great extent. Nevertheless, these two thousand women, the vast majority of whose families owned automobiles, still worked a full week in the house, dairy, garden, and poultry pen.[51]

An Ohio man's story of a farm woman and her car unwittingly provides one explanation of why the auto did not lead to more leisure. L. B. Pierce wrote the *Rural New Yorker* in 1919 that one morning, a farm woman cooked that night's dinner in a "fireless cooker" (an insulated box in which a boiled dinner could cook all day), drove forty-one miles to visit her daughter in Cleveland, shopped in the city in the afternoon, then drove home in time to put a late supper on the table from the fireless cooker. Before the family had a car, which the woman also used to run a butter and egg route, she would have had to skimp on her after-breakfast work and her husband would have had to get his own dinner. "After the car was bought she could wash the breakfast dishes, sweep the kitchen and then get to her customers as early as before, and generally get home in time to serve the dinner which the fireless cooker had been preparing in the basement."[52] The car thus enabled this farm woman to do more work—to expand her egg business and still perform the tasks expected of her within the (expanded) sphere of "woman's work" on the farm, including shopping for bargains in the city and maintaining kinship ties.

Stability of Social Meanings

The gender relations and associated meanings involved with the automobile in the countryside were quite stable over time compared with the other meanings of the car we have identified. The anticar meanings were obviously intense, but also transient, and disappeared for the most part when manufacturers introduced cars that were economical and met the criticism of the "anti's." Other social meanings, which defined the car as destroying the rural fabric of general stores, one-room schools, and local churches, eventually disappeared precisely because the countryside was transformed in the very manner feared by the critics. Between 1920 and 1940, the car had become a means to increase the radius of rural life to include larger towns, schools, and churches in the orbit of farm men and women.

In contrast, gender relations and associated meanings remained

[51] On the time-use studies see Ronald Kline, "Ideology and Social Surveys: Reinterpreting the Effects of 'Laborsaving' Technology on American Farm Women," *Technology and Culture* 38 (April 1997).

[52] L. B. Pierce to the Editor, *Rural New Yorker*, December 6, 1919, p. 1804.

fairly stable. The interpretative flexibility of the early auto reinforced them, as we have seen. The auto's replacements for farm work, the truck and tractor, did not upset the gender structure either, even though women showed during World War I that they could drive a tractor, just as their sisters proved they could do factory work during the crisis. For instance, some urban women learned to drive and maintain tractors in the American Woman's Land Army—a voluntary organization that hired out "farmerette" squads to farms during the war—and farm women drove tractors at home to meet the "manpower" shortage.[53] Yet when the war ended, farming by horse, car, or tractor was still considered to be primarily men's work. Gender relations were also not much affected by rural electrification, which—along with a general farm prosperity after World War II—enabled farm women to buy "urban" appliances like electric washing machines, ranges, irons, and refrigerators. Historian Katherine Jellison has argued that one result of this mechanization of housework, and an increased consumerism and the replacement of hired men by tractors after World War II, was to decrease women's work in the house, garden, poultry barn, and dairy, thus giving them the option of operating tractors in the field or using the auto to take a job in town. But the new technologies did not transform gender relations markedly, since women were still viewed as "helping out," as supporting men's work on the farm. Indeed, Jellison's evidence indicates that country people wove these artifacts into the fabric of their society, that they shaped them within the flexible, yet durable, system of rural gender relations.[54]

The Restabilization of the Car

Four social groups responded to the phenomenon of farm men and women opening up the automotive black box and reshaping it to their own ends. Automobile manufacturers, farm equipment manufacturers, gasoline-engine firms and the newly emergent accessory companies designed, built, and sold numerous artifacts that either assisted or replaced the work of the barnyard mechanics. The timing of their efforts indicates that these commercial social groups responded to the interpretative flexibility of the rural auto devel-

[53] *Tractor World*, September 1918, p. 40; October 1918, p. 32; January 1919, p. 16; May 1919, pp. 33, 35. Penny Martelet, "The Woman's Land Army, World War I," in *Clio Was a Woman: Studies in the History of American Women*, ed. Mabel E. Deutrich and Virginia C. Purdy (Washington, D.C., 1980), pp. 136–46; and Jellison, ch. 5. Women also built tractors in the factory during the war; see *Tractor World*, November 1918, p. 12.

[54] Jellison, ch. 6.

oped by farm men and women during the first decades of the century. Many automobile manufacturers counteracted, rather than supported, the interpretative flexibility of the rural auto in the early days of the industry. While many companies made cars with removable tonneaus before World War I, they usually discouraged using the car as a stationary power source by jacking up its rear wheels. In response to a survey on this question by the *Rural New Yorker* in 1906, six out of seven auto manufacturers adamantly opposed this common practice, mainly because it could damage the engine or differential gear. The representative of the REO company was more equivocal. Although he "did not approve of using the automobile for a traction engine, to drive a sawmill, or the different purposes which I have named," he thought that farmers could "save a considerable amount of labor" if they harnessed the auto's power properly.[55]

Based on these responses, the *Rural New Yorker* advised farmers over the next decade to purchase a stationary gasoline engine, which was regularly advertised in the journal, instead of using the car as a stationary power source, even though several technically competent farmers wrote that they had good luck with the practice. The journal modified its position in 1919 and recommended kits that (safely) took power from the crankshaft or rear axle, the type of kits that were now being advertised in its pages. Some agricultural engineers supported the position of auto manufacturers when they wrote for the journal on this topic. F. H. King warned against using the auto for general farm work in 1907. In the 1920s, Robert Smith placed his expert authority behind the journal's earlier policy of warning that homemade kits could damage a car's engine and differential gear.[56]

The Ford Motor Company took a more positive view of the alternative uses of the automobile. One of the earliest published photographs of a car providing a stationary source of power, in fact, shows Henry Ford sawing wood with a new Model A Ford in 1903. Power was taken from a pulley connected to a long shaft inserted into a

[55] "Automobile Engines for Farm Work," *Rural New Yorker*, December 22, 1906, p. 945. The other companies were Electric Vehicle, Knox, Pope, Nordyke & Marmon, Winton, and Franklin.

[56] *Rural New Yorker*, January 19, 1907, p. 38; June 22, 1907, p. 492; February 8, 1913, p. 165; March 8, 1913, p. 371; March 29, 1913, p. 468; August 3, 1913, p. 976; July 11, 1914, p. 910; April 12, 1919, p. 647; December 6, 1919, p. 180; February 21, 1920, p. 364; January 10, 1925, p. 58; March 21, 1925, p. 506; and September 12, 1925, p. 1216. For similar complaints by an agricultural engineer in the Midwest, see *Wallace's Farmer*, September 9, 1917, p. 1218.

crankshaft connection in the side of the car.[57] The *Ford Times* published a photograph of a Model S sawing wood in 1908. Shortly after the Model T came out later that year, H. B. Harper, editor of *Ford Times*, wrote an article for the magazine in which he matched the Model T's technical characteristics point-for-point with those he thought farmers required, concluding that "with a little ingenuity the engine [of any automobile] can be made to run the cream separator, saw the wood or pull a trailer loaded with farm produce or housing supplies." For much of the Model T's long life, Ford magazines and sales bulletins published numerous stories of how farm men had harnessed the Tin Lizzie to do their chores, including plowing, in support of the advertising slogan that the Model T was the "universal car."[58]

In 1912, at the height of this publicity, *Ford Times* reprinted a poem from a Peoria, Illinois, newspaper, which began: "The auto on the farm arose/Before the dawn at four./It milked the cows and washed the clothes/And finished every chore." After reaping, threshing, plowing, pumping water, grinding corn, and hauling the baby "around the block" to put it to sleep, the tireless "patient auto stood outside/And ran the dynamo" so the up-to-date farmer could read by electricity. The magazine changed the title of the poem from "The Auto on the Farm" to "Farming a la Ford."[59] In a similar vein, a humorous postcard series, "Let Lizzie Do It," produced (apparently) independently during World War I, showed the Model T doing a host of farm chores, including running a washing machine and plowing a field (fig. 3). Interestingly, women operated the cars for both applications. As with the popular Ford-joke books, the company saw no reason to discourage the free publicity.[60]

[57] *Horseless Age*, November 4, 1903, p. 479; and photographs 188-20749, 188-4763, and 0338, FMCA, Acc. 1660, Box 9. An annotation on the back of photo 188-4763 speculates that they were taken either at the Ford farm, or at the back of the home of Henry's wife Clara. Photo 188-20749 is reproduced in Flink, *Automobile Age* (n. 1 above), p. 100.

[58] *Ford Times*, July 1, 1908, p. 34; Harper (n. 45 above), p. 6 (quotation). For examples, see *Ford Times*, August 1, 1910, pp. 481–82 (grinding grain); December 1910, pp. 112–13 (hauling produce); November 1911, p. 34 (filling silo); August 1, 1912, p. 357 (sawing wood); and September 1913, pp. 509–11 (general); and *Ford Sales Bulletin*, June 17, 1916, p. 195 (plowing). After Ford introduced a tractor and truck, the stories tended to be about using discarded Ford engines; see, e.g., *Ford News*, October 1, 1923, p. 5.

[59] *Ford Times*, August 1912, p. 361. The original poem also had two more stanzas, including the one about driving the baby around the block; see *Peoria Transcript*, n.d. (c. 1911), Reel 1, vol. 1, p. 7, FMCA, Acc. 7.

[60] Two postcards from this 12-card series are in FMCA, General Postcard Collection, Box 2 (caricatures); two others are in the collection of Ronald Kline. On the

FIG. 3.—Postcard showing alternative uses of the Model T on the farm. (Courtesy of Henry Ford Museum & Greenfield Village.)

Several accessory manufacturers took advantage of the car's interpretative flexibility and began to commercialize it. Although firms brought out kits to convert the car into a stationary source of power as early as 1912, advertisements for these kits—and others to convert the car into a tractor—did not appear in large numbers until 1917, during wartime shortages of farm labor and horses. Some companies simply sold a pulley to be attached to a jacked-up wheel, but most kit manufacturers realized that jacking up one wheel put an undue strain on the differential gear as one wheel is turning while the other is stationary on the ground.[61] Most kits, therefore, were designed to overcome the problem with the differential. *Scientific American* described a kit in 1917 that avoided wearing out the differential gear by jacking up both sides of the car and taking power directly from the axle. The Lawrence Auto Power Company in St. Paul, Minnesota, advertised a $35 kit that would take power directly from the crankshaft in the front of a car without having to jack up the car. The company claimed that the device—consisting of a tie-rod, two pulleys, and a metal stand—could operate a feed grinder, corn sheller, silo filler, wood saw, and cream separator. From 1917 to 1919 many

company's attitude toward the Ford jokes, see Lewis (n. 1 above), pp. 121–26. One card showed Maud Muller, a stock poetic figure representing fam women working in the field, now up-to-date because she plowed with a Ford.

[61] *Ford Times*, August 1, 1912, p. 357; *Wallace's Farmer*, May 18, 1917, p. 817; *Rural New Yorker*, July 21, 1917, p. 909.

other companies sold a variety of kits designed to take power off the crankshaft without jacking up the wheels. These included the E.F. Elmberg Company of Parkersburg, Iowa, the Ward Work-a-Ford company of Lincoln, Nebraska, the Auto Power and Malleable Manufacturing Company of Omaha, and Knight Metal Products of Detroit. The advertisements for the latter company stressed that the device and a Ford car cost less than a 14 horsepower stationary gasoline engine. The Maxim Silencer Company sold a kit for sawing wood as late as 1948.[62]

Firms also introduced more elaborate kits that allowed the car to act as an agricultural tractor during the high wartime demand for farm products in 1917. Food shortages led the federal government to encourage farmers to "plow to the fences," which provided an added incentive to buy tractors or kits. We have found three prewar instances where farm men yoked the automobile to the plow. A prosperous Ohioan got his picture in *Scientific American* in 1903 by plowing a field with a plow attached to his touring car driven by a chauffeur; a Montana barber-farmer accomplished the same feat with a Model T in 1916. A. W. Bell, a Canadian farmer, converted his three-year-old Overland into a more robust "tractor" in 1915 by replacing the car's rear wheels with larger, steel, reaper wheels attached to a heavier axle.[63] The conversion kits, which came out in a flurry in 1917, did not deviate much from Bell's design. Typically consisting of tractor-like drive wheels, a heavy axle, reduction gears to lower the speed to about three miles an hour, a large radiator, forced-feed lubrication system, and other means to reduce overheating problems, these kits sold for $97.50 to $350. Advertisements claimed they could quickly convert the popular Model T (and other cars) into a tractor that would pull plows, harrows, mowers, binders, and other implements in the field, or into a traction engine (with a different set of wheels) that would pull road graders, wagons, and other heavy loads on country roads. A four-page ad for the "Any Auto" also boasted a pulley attachment so farmers would not have to jack up

[62] *Scientific American* 117 (1917): 32; *Wallace's Farmer*, September 7, 1917, p. 1213 and September 28, 1917, p. 1320; *Motor Age*, October 3, 1918, p. 104 and November 6, 1919, p. 149; *Rural New Yorker*, January 11, 1919, p. 70, December 6, 1919, p. 1802, and November 20, 1948, p. 712. An ad for the World War I era Lawrence kit is reprinted in Paul C. Johnson, *Farm Power in the Making of America* (Des Moines, Iowa, 1978), p. 127.

[63] Frank McClure, "The Automobile as a Plow Horse," *Scientific American* 89 (1903): 201; *Ford Sales Bulletin*, June 17, 1916, p. 195, FMCA, Acc. 972, Box 1913–1916; *Motor Age*, September 2, 1915, p. 46.

a car to take power from the rear wheel (fig. 4). We have counted twenty-two companies that made these kits, including the Smith-Form-A-Tractor Company and the Uni-Ford Tractor Company in Illinois; the American Ford-A-Tractor Company and the Hardy Hank Company in Minnesota; the Geneva Tractor Company in Ohio; the F. R. Corcoran Company in New York; and the L. A. Tractor Company in California.[64]

Most of these products seem to have led a relatively short life, but the Pullford Company of Quincy, Illinois, brought out a kit for $135 in 1917 and advertised it continuously from that year until at least 1940.[65] Pullford and the Shaw Manufacturing Company of Galesburg, Kansas, which also made garden tractors, responded to the economic crisis of the Great Depression by targeting their ads toward farm men who were prosperous enough to have an old car to convert permanently into a tractor, but not wealthy enough to buy a tractor. Pullford followed this strategy as late as 1940, when it made kits that would fit a Model T, a Model A, a 1926–31 Chevrolet, or a powerful 1932 V-8 Ford. Beginning in 1930, the company changed its standard advertisement picture from that of a young farm man cheerfully plowing with a "flivver," which he could later reconvert and drive to town, to that of a middle-aged, no-nonsense, professional farmer plowing vigorously ahead with a kit that had turned a now-unidentifiable car into a permanent workhorse that emulated the gasoline tractor.[66] In terms of SCOT, we would say that Pullford, like other kit manufacturers, followed its practice of supporting the interpretative flexibility of the car by commercializing what farm men were doing in the field. Ford, for example, received letters

[64] *Wallace's Farmer*, January 12, 1917, p. 49; February 9, 1917, pp. 243, 270; March 2, 1917, p. 401; March 16, 1917, p. 510; and July 27, 1917, p. 1054. *Motor Age*, May 17, 1917, p. 42; May 24, 1917, pp. 40–41; November 22, 1917, pp. 71–74; December 13, 1917, p. 46; February 21, 1918, p. 9; and July 4, 1918, p. 42. C. L. Edholm, "The Car of All Work," *Scientific American* 116 (1917): 349. Victor W. Pagé, *The Model T Ford Car, Truck and Tractor Conversion Kits* (New York, 1918), pp. 285–89. *Automotive Industries*, March 6, 1919, pp. 528–29. *Tractor World*, November 1919, p. 14. *Rural New Yorker*, September 27, 1919, p. 1409 and December 12, 1931, p. 1208. *Farm Journal*, January 1923, p. 76. Johnson, pp. 126, 128. Joseph Floyd Clymer, *Henry's Wonderful Model T* (New York, 1955), pp. 164–65. Wik, *Henry Ford* (n. 2 above), p. 33, and "The Early Automobile and the American Farmer," in Lewis and Goldstein (n. 1 above), pp. 37–47, on p. 45. Berger (n. 2 above), pp. 40–41.

[65] Wik, *Henry Ford*, p. 33, and Robert C. Williams, *Fordson, Farmall, and Poppin' Johnny: A History of the Farm Tractor and Its Impact on America* (Urbana, 1987), p. 52, say technical problems were key factors in the kits' demise. The development of small tractors undoubtedly played a role, as well.

[66] See ads in *Rural New Yorker*, 1919 to 1940. The last ad we found for Pullford was February 10, 1940.

FIG. 4.—"Any Auto" advertisement. (*Motor Age*, November 22, 1917, pp. 71–72.)

about how farm men had converted an old Model T or Model A into a tractor in the late 1930s and early 1940s.[67] The fond recollections in recent oral history interviews of nicknames for these cars—"Skeeter" in the south, "Puddle Jumper" in the midwest, and "Doodle-Bug" in the northeast—indicate the prevalence of this practice.[68]

How did auto manufacturers respond to these kits? The Ford Company seems to have been ambivalent about them before developing its own line of tractors and trucks. When a Canadian man asked Henry Ford in 1908 to comment on his idea of designing cars that could provide stationary power, Ford's secretary replied that even "ordinary automobiles" had been used in this manner, and Ford was designing a tractor that would fully meet these needs. Ford gave a similar answer to a proposal for an auto-tractor combination vehicle that year. But in 1912, *Ford Times* published a photograph of a Model T using a Home Auto Kit to saw wood. Replying to a proposed car-tractor-truck vehicle in 1919, Ford's secretary said that "this is a combination we do not believe would work satisfactorily."[69] By that time, the Ford Company had introduced a complete automotive ensemble for the farm—car, truck, and tractor—and thus had little interest in multiple-use vehicles or conversion kits. The firm told its dealers in 1916 that it did not want them to convert "Ford cars into trucks and other makeshifts not recommended or sanctioned by us." Making such alterations would cost them their dealership. The company advised dealers the next year not to sell truck kits because it had just put a Ford truck on the market. Despite

[67] Emily Schluenzen to Henry Ford, June 28, 1939, letter no. 25395; Leonard Dieler to Henry Ford, August 3, 1939, letter no. 17015; Fred Desosivay to Henry Ford, June 3, 1940, letter no. 17021; and George Jallings to Henry Ford, April 23, 1942, letter no. 36464, FMCA, Acc. 380.

[68] Conversations between Ronald Kline and Scott Crawford, November 2, 1993 (1927 Skeeter in North Carolina), Kline and Raymond Kline, Fall 1994 (1930s Puddle Jumper in Kansas); Suzanne Moon, oral history interview with Jessie Hamilton, November 28, 1994 (Model T Doodle-Bug in New York) (see n. 36). Possible related meanings of "doodle-bug" were a gasoline railroad car, a midget racing car, or the V-1 rocket that landed in Britain during World War II. See Matthews (n. 16 above).

[69] John Matheson to Henry Ford, November 28, 1908; FLK to Matheson, December 1, 1908; W. W. Walker to Henry Ford, November 26, 1908; and FLK to Walker, December 1, 1908, FMCA, Acc. 2, Box 28. J. M. Bullock to Henry Ford, February 3, 1919; G. S. Anderson to Bullock, February 5, 1919, FMCA, Acc. 62, Box 78. *Ford Times*, August 1, 1912, p. 375. Although not identified as such, a kit may also have been used by the Model T grinding grain shown in *Ford Times*, August 1, 1910, pp. 481–82.

these tactics, the sales of truck kits climbed, and the company warned dealers in 1918 that owners would void their warranty by altering their cars in this manner.[70]

These actions reveal the type of power relations between commercial social groups that became common during the growth of large corporations in this period. In terms of SCOT, Ford dealers are a new relevant social group that interpreted the car differently than the Ford Company, i.e., as a multipurpose vehicle, and cashed in on this interpretation by selling conversion kits. Although the dealers shared an interpretation of the car with the kit makers and many farmers, they had a subservient contractual relationship with the Ford Company. In this case, one social group used the closure mechanism of contractual power to force another social group to assist it in bringing about the closure it desired.[71] One limit to Ford's power, of course, was that Ford dealers could go into another line of business or become dealers for another manufacturer. Dealers who remained with Ford assisted in the restabilization of the automobile on the farm by not selling conversion kits.

In the long run, however, redesigning tractors and trucks during World War I was probably the most effective means by which manufacturers of automobiles and farm implements responded to the interpretive flexibility of the car. Before this time, gasoline tractors had many of the drawbacks of the heavy, expensive steam-engine tractors on which their design was based. After the decade-old gasoline tractor business nearly collapsed in 1912, farm equipment firms and some automobile manufacturers like Ford designed smaller, less expensive tractors. By 1940, large numbers of farm families began to buy mass-produced tractors having belt-power capabilities (a popular item), rubber tires (instead of steel wheels), and a three-point hitch (to prevent the light tractor from rearing) to replace their

[70] "Altering Ford Cars," General Sales Letter No. 119, February 28, 1916; "Truck Attachments and Special Bodies," General Sales Letter No. 242, September 17, 1917; and "Attachments to Ford Cars," General Sales Letter No. 267, April 24, 1918, FMCA, Acc. 78, Box 1.

[71] Our analysis of power here resonates with that developed by Bijker, *Of Bicycles* (n. 7 above), p. 262. Bijker uses social theorist Anthony Giddens's definition of power as the transformative capacity to harness the agency of others to comply with one's ends. Bijker is concerned to counteract overly simplistic uses of power which simply treat power as "stuff" which one group will possess more of than another. This is a useful cautionary note; dealers may not always have to be as compliant as in this particular case.

horses, steam engines, the stationary-power auto kits, and the auto-tractor conversion kits.[72]

Although tractor manufacturers dismissed the tractor kits as impractical, they seem to have posed something of a threat to these firms. The Pullford Company advertised for several years that its kit had competed successfully with gasoline tractors in a national plowing contest in Fremont, Nebraska in 1917. Companies demonstrated conversion kits at national and state tractor shows as late as November 1919 and entered four of them in the 1918 plowing contest at Salina, Kansas. In a retaliatory move, the American Tractor Association, a powerful trade group, requested in late 1918 that the War Industries Board modify its order reducing the amount of iron and steel allotted to the manufacture of tractors by adding a provision that would "prohibit entirely the manufacture of attachments for converting automobile and motor trucks into tractors for farm use."[73] Henry Ford, who ironically conducted most of his tractor experiments with automobile engines, obviously hoped that farmers would buy the newly introduced Fordson tractor instead of conversion kits, which the company generally discouraged, as we have seen. The advertising manager for the La Cross Tractor Company told tractor dealers in 1918 that he advised farmers to use a stationary gasoline engine, rather than a tractor, to drive small devices like washing machines. He favored saving the tractor's belt power for larger jobs. But the "jacking up of an automobile and attaching a belt to one of the hind wheels to drive a grindstone or a cream separator, is simply ridiculous and should not be given serious consideration by anybody."[74]

[72]Wik, *Steam Power on the American Farm* (n. 40 above), ch. 9; Williams, *Fordson, Farmall, and Poppin' Johnny* (n. 65 above).

[73]*Motor Age*, February 21, 1918, pp. 7–9 and August 22, 1918, pp. 312–14; *Tractor World*, August 1918, pp. 33–39, March 1919, pp. 5–13, and November 1919, p. 14; *Automotive Industries*, November 14, 1918, p. 849 (quotation); and Williams, *Fordson, Farmall, and Poppin' Johnny*, p. 52. Although Williams says that the trade group succeeded in prohibiting the manufacture of kits, it is not clear if the War Industries Board accepted this part of the proposal. For examples of Pullford advertising its success at the Fremont trials, see *Motor Age*, October 11, 1917, p. 40; *Rural New Yorker*, February 1, 1919, p. 102; and Johnson (n. 62 above), p. 128. On these contests, see Reynold M. Wik, "Nebraska Tractor Shows and the Beginning of Power Farming," *Nebraska History* 64 (1983): 193–208.

[74]W. A. Jones, "Demonstrating General Work Utility of Farm Tractors," *Tractor World*, November 1918, p. 10. On Ford's tractor experiments, see photograph number 833.63702, 1907, FMCA, Acc. 1660; *Motor Age*, June 3, 1915, p. 18; "Cost of Experimental Work on Tractor," n.d. [c. February 1916], FMCA, Acc. 62, Box 87; Wik, *Henry Ford* (n. 2 above), pp. 84–86; and Williams, *Fordson, Farmall, and Poppin' Johnny*, pp. 47–48. *Ford News*, in the early 1920s, is filled with stories about Fordson's

This type of closure mechanism, in which manufacturers criticized alternative uses of the car and introduced new products to eliminate its interpretative flexibility, continued with the motor truck. The truck became a serious product during World War I when demand for troop and equipment movement led to a sturdier vehicle and a huge manufacturing capacity. Recognizing these trends, Ford introduced a one-ton truck in 1917, which, in combination with the company's warranty policy on alterations, helped put an end to the Model-T truck conversion business.[75]

Gasoline engine manufacturers also reacted to the new source of power on the farm. Having sold stationary engines for belt-work on the farm since the turn of the century that were powerful, but rather expensive and difficult to start, these firms faced stiff competition from the power take-off capabilities of automobiles and tractors. The Maytag company responded in 1915 by adding a kick-start gasoline engine to power its washing machines. Historian Paul Johnson has said that only then did farm "women begin to feel at home with [gasoline] engines." Yet numerous oral histories relate that farm women still had problems and many relied on a male to start balky gasoline-engine washers.[76] Maytag and many other companies sold these washers into the 1940s, when rural electrification became more common, often with the option of using a gasoline engine or an electric motor.[77] Farm people who could afford the device no doubt preferred it to jacking up the car to do the wash.

Despite the increased availability of tractors, trucks, and gasoline engines, farm men and women owned many more automobiles than these technologies before World War II. Census data for the United States shows that automobiles were far and away the most popular form of inanimate power on the farm from 1920 to the war. A major reason was that during the agricultural economic crisis of the 1920s and 1930s, farm men and women preferred to use their autos, often

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power take-off option being used to power all types of farm chores and industrial processes.

[75]James R. Wren and Genevieve J. Wren, *Motor Trucks of America* (Ann Arbor, 1979), p. 69.

[76]Johnson, p. 119; Eleanor Arnold, ed., *Party Lines, Pumps and Privies: Memories of Hoosier Homemakers* (Indianapolis, 1983), pp. 65–66; and Suzanne Moon, interviews with Goldie Jarvis, November 28, 1994, John Nichols, May 22, 1995, and Sylvia Schrumpf, January 24, 1995 (see n. 36).

[77]Tom F. Blackburn, "Washers Getting Better and Better," *Electrical Merchandising*, November 1940, pp. 6–15, 70. For typical Maytag ads, see *Wallace's Farmer*, October 12, 1935, p. 19, and Katherine Jellison, " 'Let Your Cornstalks Buy a Maytag': Prescriptive Literature and Domestic Consumerism in Rural Iowa," *Palimpsest* 69 (1988): 132–39.

purchased during the boom times of World War I, for multiple purposes like going to town, hauling produce, powering farm equipment, and even field work (for those who bought conversion kits or made their own). Large numbers of prosperous farms did, however, buy tractors, trucks, and gasoline engines. A survey of 538 well-to-do Minnesota farms in 1929 showed that over 90 percent of them had autos, two-thirds had stationary gasoline engines, nearly one-half had tractors, over one-third had electricity, and about one-third had trucks. The families used their autos almost equally for farm and family purposes, but the study did not mention any belt-power use of the car. The families made heavy use of tractors, gas engines, electric motors, and trucks to pull agricultural implements, provide belt power, and to haul farm products.[78] More and more farms in the United States made these same technological choices after the federal government established a New Deal program in the 1930s that provided low-cost loans to purchase farm equipment.[79] The program led to a large increase in the number of tractors on farms, thus helping to displace the rural auto as an all-purpose power source.

Conclusion

In our story of the early adaptation of the car into American rural life we have tried to bring into play some of the ideas in SCOT, including such notions as relevant social groups, interpretative flexibility of the artifact, and closure. We have sought to extend this approach by focusing upon a case of a well-stabilized artifact which users adapted in new ways. We have explored the gender relationships between social groups in order to get a better understanding of how this interpretative flexibility appeared at the user stage.

It is clear that mutually constructed gender relationships and the transactional relationships between manufacturers, dealers, and buyers both constrained and enabled the design and usage of this technology. But the types of development processes we have identified sometimes followed paradoxical paths. Thus it was a masculinized gender position which enabled farm men to open up the black box of the car and for a time threaten the predominant meaning of the artifact. However, at the same time these new options reinforced predominant gender identities. For car manufacturers the new inter-

[78]William L. Cavert, "Sources of Power on 538 Minnesota Farms," (Ph.D. diss., Cornell University, 1929).

[79]Sally Clarke, "New Deal Regulation and the Revolution in American Farm Productivity: A Case Study of the Diffusion of the Tractor in the Corn Belt, 1920–1940," *Journal of Economic History* 51 (1991): 101–23.

pretative flexibility at first was a threat, but in the long run it helped to open up new and profitable markets as they and other manufacturers sold machines dedicated to each of the different usages we have identified. However, differentiation of usage and the creation of a new market is not always the response. The early attempts to manufacture an electric car for women failed and instead manufacturers adapted the gasoline car to make it more appealing to women (and men) users by inventing the electric starter and introducing the closed-in top and thereby created a larger market for an existing product. Thus the meaning of the car was changed in response to the social group of women, but whether the newly changed artifact significantly altered gender relations is, as historian Virginia Scharff shows, unlikely.[80] However, the new (gasoline) car enabled different gender identities to be constructed. Women could do new sorts of things—it gave them a new freedom, and men did not have to be quite so manly (and risk life and limb cranking cars). Thus the meaning which using the technology gave to underlying gender identities shifted those identities somewhat.

Throughout this paper we have attempted to show how artifacts and social groups are tied together during the course of technological development. We agree with recent scholars that users socially construct technology. Our approach has been to show how an explicit model of social construction can be used as a heuristic to tell a full story of users and technology. We have argued that such a story should examine the radical options for change and how other social groups respond to such options and thereby create new artifacts.

The interpretative flexibility we have described for the car disappeared by the early 1950s. Closure had occurred (once again) and farm people had stopped using their autos for grinding their grain, plowing their fields, or carrying their produce to town. Instead, they had begun to buy tractors and pickup trucks in large numbers—new artifacts that manufacturers developed partly in response to these novel interpretations of the car. The users, so easily overlooked in writing the story of technology, had made their mark.

[80] Scharff (n. 1 above), ch. 9. See also McShane (n. 1 above), ch. 8.