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## **What Can We Learn from the Carousel of Progress?**

by

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## **ABSTRACT**

The Carousel of Progress, originally displayed in the General Electric pavilion of the 1964-65 New York World's Fair, presented four tableaux of American households at roughly twenty year intervals beginning at the turn of the twentieth century. Although this was not the message intended, a discerning viewer came away from the show with the impression that although many new products marked the transition from 1900 to the 1920s, subsequent improvement through the 1940s and 1960s had been almost entirely cosmetic. The dishwasher and television appeared in Act III; there were no new products at all featured in Act IV. How can we reconcile this apparent discontinuity with the quantitative record which shows continuing advance in the material standard of living across the Depression years and beyond? What did the Carousel basically get right, and where does it mislead?

General Electric's Carousel of Progress at the New York World's Fair made a lasting impact on an impressionable teenager. The 1964-65 version of the rotating exhibit showed dioramas of the interior of American households circa 1900<sup>1</sup>, during the 1920s (probably 1927), the late 1940s ("the fabulous forties"; no mention of the war), and the late 1960s ("sometime after 1967"). The dioramas were populated by moving and talking ("Animatronic") characters, who extolled the benefits of progress. Each shows a family at home during a holiday (Valentines Day, the Fourth of July, Halloween, or Christmas/New Years), so all are able to enjoy the splendors of an American house, outfitted with the latest appliances.

The Carousel was designed and created by the Walt Disney Company for the General Electric Corporation, with the close involvement of Disney himself. From the current introduction: "The Carousel of Progress was Walt's idea from beginning to end, and he loved it... Walt loved the idea of progress, and he loved the American family... He thought it would be fun to watch the American family go through the twentieth century, experiencing all the new wonders as they came...." The show had antecedents in Depression era films promoting rural electrification, as well as the 1933-34 (Century of Progress) World's Fair in Chicago, which featured four rooms showing American households at different dates.

The attraction moved across the country following the close of the fair, and reopened in Disneyland in California in 1967, where it played through September of 1973. After a second closure and another cross country move, it reopened on January 15, 1975 in Disney World in Florida, where it currently resides. General Electric ceased sponsorship in 1985, after which the show became known as "Walt Disney's Carousel of

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<sup>1</sup> A reference to the St. Louis World's Fair suggests Act I could have been as late as 1904.

Progress.” With the decline in park attendance following September 11 it operated seasonally on peak park visitation days between 2001 and October 2003, after which it resumed almost daily operation.

The show was wildly popular when it first opened. Even though two hundred people could enter (and leave) the show every four minutes<sup>2</sup>, waits to get in were often an hour or more. Over the decades the Carousel of Progress became something of a cultural touchstone, even spawning its own website, with enthusiasts organizing in response to rumors that the show might be permanently shut down. Disney claims that the Carousel has had “more performances than any other stage show in the history of American theatre.” Almost half a century later, it continues to have appeal. For those who have seen it, the Carousel is a visually powerful mini-course in U.S. economic history, for many the only “instruction” in this area they will receive. The show packs a great deal into twenty-one minutes; home videos of its various iterations can be viewed on YouTube and elsewhere.<sup>3</sup>

Since the New York Fair, Disney’s Imagineers have updated the fourth (“modern”) “Act” several times, although the first three dioramas remain essentially as they were in 1964 (the script for all of the acts was altered somewhat in the version that ran from the 1970s through the 1990s, but in 1994 Disney restored most of the original script, minus the references to General Electric, for Acts I- III). One of the peculiarities of the exhibit as now constituted is the growing asymmetry in the time gap between the acts. The intervals between Acts I and II and Acts II and III remain, as they were originally,

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<sup>2</sup> The physical facility was itself innovative. The audience rotated around six stages in a circular theatre: one stage for each of the four acts and one each for audience ingress and egress. Because the “actors” were animatronic, Disney had little to fear from performer fatigue.

<sup>3</sup> Search YouTube for Carousel of Progress, or go to [www.carouselofprogress.com](http://www.carouselofprogress.com), which contains scripts, videos, audio tracks, and other memorabilia.

somewhere between twenty and twenty seven years whereas the interval between Acts III and IV, which was originally of similar length, has now grown, as the consequence of minor (1967, 1985) and major (1975, 1981, 1994) updates, to more than half a century.<sup>4</sup> The gap between Acts III and IV is now longer than the combined gap between Acts I and III. But this has not altered the intended theme of the exhibit, one which emphasizes steady progress towards a better tomorrow.<sup>5</sup>

### Act I: ~ 1900



<sup>4</sup> In the versions of the show that played from 1975 through 1994, the script changed somewhat. The original script read “We’ve come a long way since the turn of the twentieth century, over twenty some odd year ago.” The “new” script read: “We’ve progressed a long way since the turn of the century twenty years ago”, which situates the scene definitively in 1920. Implausibly, though, the crystal radio brings news of Lindbergh’s landing in Paris, which occurred in 1927. It is also highly unlikely that even an upper income household in 1920 would have had a mechanical refrigerator. References to Lindbergh’s imminent flight and the opening of the “The Jazz Singer” identified 1927 as the Act II year in the original (and now current) script. Also, in contrast with the original script, in Act II, when the appliances start operating themselves, the father only warns about a blown fuse; the fuse does not actually blow, taking down the whole neighborhood, as it does in the original script. The revised script toned down some of the patriarchal and sexist overtones in the original and had a more feminist sensibility. In Act III, the electric belt exercise machine is no longer treated as a silly relic of the 1920s (“didn’t work then; doesn’t work now” and instead is treated as a useful innovation. The mother is now characterized as ingenious for using her food mixer to stir paint (rather than this being an innovation designed by the father, which, the mother wistfully complains, will ruin her mixer, not that he would care). The mother also asks (nicely) why, if the father hired a man to paint the rumpus room, he would be paid, she shouldn’t get equal pay? The father says they’ll discuss this later. She asks nicely, when? Disney returned to the original script perhaps out of nostalgia, perhaps because the political tenor of the audience became more socially conservative.

<sup>5</sup> The 1975-1994 scripts have a more presentist orientation. GE seems to have been concerned that consumers stop dreaming about the future and get out and upgrade now.

I had little premonition in 1965 of my future calling as an economic historian, although perhaps this show played some role in awakening it. What impressed me then was that there appeared to have been enormous changes, particularly in the form of new products or radical design changes in existing products, between 1900 and the 1920s. Visible innovations in the exhibit included indoor plumbing, electric lighting, and an electric refrigerator, oven, range, iron, toaster, waffle iron, coffee percolator, and space heater. Elsewhere on the set one could see or hear discussed an electric radio, sewing machine, washing machine, and the vacuum cleaner. These changes (now speaking as an economic historian; I don't claim to have appreciated this in 1965) reflected three advances in the household use of electricity: carbon-tungsten filament light bulbs for illumination; resistance heating for cooking, space heating, and ironing, and the availability and use of fractional horsepower electric motors in a range of household appliances including vacuum cleaners, washing machines, and mixers. Electric motors were of course also revolutionizing the ways in which goods were produced and factories organized (Devine 1983; David and Wright, 2003).

It is not a surprise to learn that the exhibit was originally sponsored by General Electric. The refrigerators, for example, were from the start electric, not the quiet, vibration free, and more reliable (no moving parts) gas powered devices which briefly and unsuccessfully competed with the design now dominant in all but recreational vehicles and other off the grid applications. Similarly, the featured oven and stove top in the 1920s, 1940s, and 1960s tableaux were powered by electricity, even though the 1927 penetration of electric cooking was miniscule and in 1940 there were nine times more households cooking with gas as opposed to electricity (in 1963, 78 percent more

households still used gas as opposed to electricity) (1948 Statistical Abstract, Table 914, p. 813; 1965 Statistical Abstract, Table 1105).

### **Act II: ~ 1927**



Between Act II (the 1920s) and Act III (the 1940s), and between Act III and Act IV the changes seemed to me in 1965 to be largely cosmetic, with the exception of television and the automatic dishwasher. The styling and colors of the refrigerators changed between the 1920s and the 1960s. But they were still refrigerators, and the underlying engineering was understandably similar. A review of films and tapes of the 1960s diorama confirms my original impression: it is impossible to identify a single new product in the original Act IV. Both the dishwasher and TV are mentioned in the 1940s Act, although their actual penetration in that year was in fact still very low. In 1948 in the United States, less than 3 percent of wired households had a television (Bowden and Offer, 1994, p. 745); in 1953, dishwashers could be found in only 2.6 percent of U.S. wired households (1967 Statistical Abstract, Table 1097, p. 729). Television diffused quickly thereafter, as had radio before and as would other entertainment/communication

devices subsequently, finding acceptance much more rapidly than any of the major labor saving appliances.

### Act III: ~1947



The original Act IV could not foresee computers, the internet, cell phones, DVDs, and other IT driven innovations which, to my way of thinking have most fundamentally altered household life since the 1960s.<sup>6</sup> The 1994 update of Act IV added video games, and in one iteration, video cassette recorders. In January of 2010 a Samsung flat screen television replaced the outdated cathode ray tube in the show. Still, even though GE is no longer a sponsor, the script for Act IV continues to emphasize more traditional electrical appliances. A plot line humorously (?) has the father ruining the holiday meal by repeating Grandma's video game score which is "overheard" by the voice controlled oven. The oven is however, conventional, not very different in design from the Hotpoint appliance featured in Act II. None of the versions of Act IV mentions the microwave

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<sup>6</sup> In the alternate script that appears to have been used between the time the exhibit moved to Disney World in 1975 and 1985, the year in which GE ceased to sponsor, there is reference in Act IV to a video recorder. And in the latest Act 4, the daughter sits at a computer and the son and grandmother play a computer game.



oven, arguably the only successful new kitchen appliance of the last half century. The updates to Act IV have never been able to strike a totally satisfactory balance between a presentist and futurist orientation, and since the current version is now sixteen years old, and in need of more than minor updating, some have suggested simply restored the fourth Act as it appeared in New York at the time of the Worlds Fair

**Act IV: ~ 1967 (Kitchen; World's Fair Version)**



Even viewing updates to Act IV, and recognizing the now more than eighty year gap between the “modern” diorama and that of the 1920s, a discerning viewer could still conclude that not a great deal had changed since the 1920s. This conclusion, of course, belies the intended message of the exhibit. How could we have had continued progress (the Carousel was originally part of a larger GE exhibit called Progressland) in the face of an apparent explosion of new products between the 1900s and the 1920s and a lack thereof afterwards?

To resolve this apparent contradiction we need to identify where the Carousel basically “got it right” and where it misled. Although promotional materials suggested

that the scenes depicted a “typical” American family, it is more realistic to infer that Disney intended the diorams to represent how a relatively well off middle class American household lived in a particular year. Not everyone in the audience (or their parents or grandparents) necessarily had a house equally well equipped. The sets might include, and in a number of instances did include, products with low penetration. But these products were not supposed to be so advanced at the time as to be unfamiliar. If the tableaux were not strictly representative of “typical” American households, neither were they intended to depict the homes of tech-savvy bleeding edge adopters in each of the four time periods. Audiences understood the technologies and appliances exhibited for the earlier periods were understood as having the same familiarity and aspirational relationship with parents and grandparents as the final Act did with contemporary viewers. Each of the scenes was intended to illustrate Disney’s slightly airbrushed version of the “typical” family in that time period.<sup>7</sup>

As a teenager, I found all of this plausible. My problem was not with historical accuracy. Nor did I quibble with the representativeness of the households depicted. My difficulty was with the message of continued progress in the face of what was apparently a great discontinuity in the rate of new product introductions over the century. In “buying” the premise of the show, audiences would have inferred that the technologies or products illustrated had achieved a sufficient level of penetration to be familiar (if not owned) at the time of each tableau. They would, moreover, whether they thought about it or not, have inferred that average penetration rates did not vary greatly from one tableau to another.

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<sup>7</sup> The relative income level of the households is, perhaps deliberately, left somewhat obscure. There is no visible evidence of or mention of domestic servants in any of the Acts.

And this latter inference would have been faulty. As I will show below, the Carousel ended up exaggerating the degree of progress between 1900 and 1927 and, as a consequence, made that which occurred thereafter seem less consequential. It did so by *not* including in the 1900 diorama technologies or products which were already by then widely diffused. Moreover, it did not include low penetration technologies such as electric lighting, which would nevertheless have been familiar and aspirational. In contrast, the 1927 diorama included both technologies that could justifiably have been displayed in 1900, as well as several showcased products which at the time had achieved very low penetration.

The 1900 household, in particular displayed a pump in the kitchen sink, which the narrator proudly explained was much better than having to carry water from the well. But according to Lebergott (1996), in 1890, ten years earlier, 58 percent of urban households already had indoor plumbing (there's a reference in the script to streetcars, clearly indicating that we are not dealing with a rural household). Disney also chose not to feature interior electric lighting in the turn of the century diorama, although there is a reference in the script to Edison's lighting experiments with "snap on" lights. It is true that electric lighting for household illumination had low penetration in 1900 (about 3 percent of households). But it had been available in some markets for almost two decades, and was a much publicized feature of the 1893 Chicago ("Columbian") World's Fair. It could well have been viewed as aspirational for the representative turn of the century household. Based on criteria governing inclusion of technologies in subsequent acts, there would have been good justification for including it.

In contrast, the 1920s “Act” featured the “advances” of running water and electric illumination, both of which had high penetration by then, along with a number of new devices, in particular the mechanical refrigerator and the electrical oven/range, which at the time had very low penetration (under 3 percent of households).

Although the Carousel correctly reflected the large number of new product introductions occurring in the first three decades of the twentieth century and their paucity afterwards, it ended up exaggerating the significance of living standard improvement between Acts I and II, to the detriment of what happened thereafter. Progress in the Depression and subsequent decades was, to an even greater degree than earlier in the century, the result of infrastructural investments, process improvements, and evolutionary refinements which made an essentially similar range of consumer durables available to a broader segment of the population. Indeed, there is as at least as strong a case for locating a consumer durables revolution in the 1930s as there is in the 1920s, as Olney (1991) has maintained.

The case for the 1930s would emphasize the Depression era diffusion of large difficult to move appliances featured in the 1920s tableau, particularly mechanical refrigerators and electric ovens and ranges. Clothes washers were the third leg of this triad, although they had achieved higher penetration at the end of the 1920s than was the case for electric refrigeration or cooking. According to Bowden and Offer (1994, p. 745), washing machines could be found in 28.4 percent of wired households in 1927, and 33.4 percent in 1929, but 66.8 percent in 1941. These figures understate advance during the Depression years, since they don’t reflect the beginnings of the move toward more fully automatic machines, with integration of the washer and wringer and, in a few models, a

spin cycle rather than a wringer to remove water in advance of drying. The case for the 1920s, in contrast, would put more emphasis on automobiles and radios, not considered part of the traditional labor saving galaxy of household appliances.

Aside from the automatic dishwasher in the 1930s (which achieved significant penetration only beginning in the 1960s), the garbage disposer (introduced in the 1950s, but low penetration until the late 1960s)<sup>8</sup> and the microwave oven in the 1970s, there have been no truly revolutionary kitchen appliances in the last eight decades. Outside of the kitchen, we can identify air conditioning and television, which are mentioned and discussed in the scripts for Acts II and III respectively, as well perhaps as the gas or electric clothes dryer. A washer and drier, presumably both electric, were visible in the 1967 diorama). Penetration of clothes driers, either gas or electric, was 3.6 percent of wired households in 1953, rising to 30.5 percent in 1967 (1967 Statistical Abstract, Table 1097, p. 729). The most significant changes in household life in the last three decades has involved a range of entertainment, productivity, and communication devices associated with semiconductors, integrated circuits, and improvements in mass storage (computer, cordless and cell phones, and the internet infrastructure). These entirely postdate the original Act IV, and even some of its initial updates. Alongside these successes are a range of devices representing questionable advance, including the electric can opener, the electric carving knife (when was the last time you used either?), the electric toothbrush, or the trash compactor.

The trash compactor is perhaps illustrative of a new product innovation that failed to realize its proponents' hopes that it would eventually achieve the penetration of

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<sup>8</sup> Penetration was 3.3 percent of wired households in 1953, rising to 15.7 percent in 1967; 1967 Statistical Abstract, Table 1097, p. 729.

refrigerators and ranges. Introduced in the 1970s and immediately ridiculed by Johnny Carson as a several hundred dollar device that turned fifty pounds of stinking garbage into fifty pounds of stinking garbage, in 2001 the appliance could be found in less than four percent of American dwelling units (2003 Statistical Abstract, Table 936, p. 598). The garbage disposal has been more successful, but in 2001 was still installed in less than half of U.S. dwelling units. Dishwashers, in under 3 percent of housing units in 1953, and only 5.4 percent in 1960, achieved relatively rapid penetration thereafter, although they are today not as ubiquitous as mechanical refrigerators. In 2001 56 percent of housing units had them.

In the original version of Act IV Disney does allude to the reduced number of hours it took to acquire appliances in the late 1960s as opposed to earlier. But this was not the main argument advanced by the exhibit. Disney intended the tableaux, especially the last, to showcase an aspirational household – perhaps one that the top quintile or decile of the population might then enjoy. Most people didn't live like that. But people knew that some – the Jones' – lived like that, and the displays had a familiarity and sense of attainability that could fuel aspirations. With hard work, saving, and borrowing, a wider fraction of the population could attain this lifestyle, and General Electric was ready to help. In 1964-65, Act IV was situated a few years in the future, and many viewers probably couldn't help concluding that their house looked a lot like Act III and ought perhaps to look more like Act IV, even if they could see that the changes in the major appliances in the latter diorama were largely cosmetic. GE was surely not averse to any inclinations to upgrade that this might have induced.

The Carousel of Progress script, and the original theme song, projected an optimistic message regarding the benefits of steady technological progress, which based on my own reactions and the initial and continuing success of the exhibit, appears to have resonated during the golden age of U.S economic growth (1948-73). That quarter century experienced faster sustained growth in output per hour, and consequently the material standard of living than any other comparable period, although the Depression years (1929-41) were close (Field, 2010). The catchy lyrics of the Carousel's theme song proclaimed "There's a great, big, beautiful tomorrow, shining at the end of every day, There's a great, big, beautiful tomorrow, and tomorrow's just a dream away." The song was very effective in communicating its message of hope and aspiration, and was memorable in a Disneyesque way. Disney tried to improve upon it by replacing it in 1975 with "Now is the Time" (to buy a GE appliance?), but returned with an updated version of the original song in the show's 1994 revision.<sup>9</sup> For those who may today be more doubtful of the promise of new technologies to improve our lives, the appeal of the show may lie as much in nostalgia as in a sense that it provides a window into the future.

Although the song and the exhibit suggest a comforting continuity of progress, what impressed me most in 1965, as noted, was a sense of radical discontinuity between 1900 and the 1920s, and only evolutionary change thereafter. Reading the scripts for the original Act IV, the characters emphasize that appliances were now available in a variety of beautiful *colors*, and that it took fewer hours to earn the money to buy them (*they were cheaper*). There is reference to "her new dishwasher", but, as noted, this had already been prominently featured in the 1940s tableaux, although it was only in the 1960s dishwashers were only beginning to enjoy wider diffusion.

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<sup>9</sup> There were minor alterations in Acts 1-3, with b

*But there were no new products visible or discussed.* After two decades of golden age growth this is really quite remarkable. Neither the microwave oven, nor perhaps more understandably, the garbage disposal, which diffused widely in the 1970s and 1980s, were featured or mentioned (a prototype air conditioner is mentioned for the 1920s). Thankfully, the narrator (father) did not wax enthusiastically about electric carving knives. Moreover, because of the paucity of new products to ballyhoo, the scriptwriters felt compelled in the last two acts to make jokes about frivolous uses of electrical appliances. In the original 1940s tableau, the daughter is trying to lose weight with an electric powered vibrating belt. “You hear that?” says the father, “She’s using that old exercise machine she rescued from the attic. It was all the rage in the Twenties. Grandma had to have one ... didn’t work then, doesn’t work now.” And the mother in the household is remodeling the “rumpus room” using a paint stirrer which the father has improvised from a stand mixer. “Yes, John, you’re a genius,” says the mother, “Of course this will ruin my food mixer. Not that you’d care...” Given the relative equanimity with which the mother (Sarah) accepts the demise of her mixer we may infer that it is not a device she uses often. The 1994 incarnation of Act IV shows the father ruining the holiday dinner by repeating Grandma’s high score on a video game, which the voice controlled oven interprets as an order to raise the temperature to 925 degrees.

In contrast, the laughs in the 1920s tableaux comes from a blown fuse resulting from too many useful electric devices operating at once, as opposed to Acts III and IV, which find humor in questionable products, or questionable uses of products, or refinements of well established appliances (voice controls for an electric oven) which turn out to be of questionable value.



Bowden and Offer (1994, p. 733) echo this conclusion about the evolution of household appliances: “Although often marketed on superficial styling and feature changes, their functionality has not changed very much in decades.” And they cite Joann Vanek, in concluding that “In 1960 American women were spending about as much be related to the historically slower diffusion of labor saving devices in comparison with audio or visual entertainment/ communication innovations.”<sup>10</sup>

The forty-five years since the World’s Fair decamped from Flushing Meadows, leaving only the Unisphere and a few other buildings as evidence of what was arguably one of the last great international exhibitions, do not appear to fundamentally challenge the impression conveyed by the original exhibit. Looking back from the vantage point of 2010 at the American kitchen and living areas circa 1925, 1948, or 1967, there appear to have been few significant changes in the kitchen, with the exception of the aforementioned microwave oven and garbage disposers. Municipal regulations hampered the diffusion of the latter; they were illegal in New York City, for example, until 1997). With respect to personal transportation, alluded to, although not seen in the tableaux, I could today perfectly well use the cars I drove in the 1960s – and hundreds of vehicles from this era are still on the road. Bresnahan and Trachtenberg (1997) suggest that most of the revolutionary quality improvements in the automobile were in place by the 1930s.

Clothing is not mentioned in any of the scripts (except in the first Act, where reference is made to the large amount of time consumed in washing, drying, and ironing). As for clothes themselves, I could perfectly well wear the clothes I wore in the 1960s (with perhaps some minor alterations), and I could perfectly well live in a house built in the 1950s (or the 1920s for that matter). In fact I do. Aside from enclosed luggage bins

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<sup>10</sup> See also Mokyr (2000) for possible explanations

**Table 1**  
**New Products Visible or Mentioned in the Carousel of Progress**

Visible	Mentioned		Act I ~1900	Act II ~1927	Act III ~1947 (fabulous 'forties (I,II) (frantic 'forties (II))	Act IV ~1967
X	X	<b>Plumbing</b>	hand pump kitchen sink five gallon hot water reservoir	pipd running water kitchen sink  bathroom sink bathtub flush toilet	pipd running water kitchen sink	pipd running water kitchen sink
X	X X	<b>Lighting</b>	gas/kerosene	electric lights (interior) electric street lights (b)	electric lights	electric lights
X	X	<b>Refrigeration</b>	ice box	electric refrigerator	electric refrigerator	electric refrigerator (colors)
X X X X X	X X(II) X(II) X(II) X	<b>Food Preparation</b>	coal fired cast iron stove	electric stove and oven coffee percolator toaster waffle iron	electric stove and oven    electric mixer	electric stove and oven
X	X X	<b>Heating/cooling</b>		electric space heater electric fan over ice		
X X	X	<b>Cleaning</b>	vacuum cleaner (hand pumped) washing "machine"	vacuum cleaner (electric)	washing machine dishwasher	washing machine dishwasher
X X X	X(II)	<b>Clothes maintenance</b>	flat iron	electric iron (a)  sewing machine (visible)		clothes drier
	X X X X	<b>Transportation</b>	automobile (8,000 in country) airplane (on horizon) electric trolley train NY-CA 7 days	auto with electric starter   NY-CA 3 days	commuting (a,c)	
X	X	<b>Entertainment</b>	Victrola	phonograph Radio (Crystal(b)/Plug in(a,c)	Radio Television	Radio Television VCR (b)
X X	X X		Silent Films Stereoscope	Talking Films		
X (II,III) X X	X (I,III) X	<b>Communication</b>	Telephone	Telephone  Electric Clock	Telephone hearing aid (b)	

**Notes:**

Three main (and a number of minor) script variants have been featured in the Carousel. Where I need to distinguish I use (a) to refer to the original version at the World's Fair, (b) to refer to the versions that played from 1975 - 1994 at Disney World, and (c) to refer to the version that played from 1994 to the present. My main focus is on Acts I-III; I haven't chronicled the various iterations of Act IV. Versions (a) and (c) are quite similar for Acts I-III.

Where appliances were visible or mentioned in some but not all of the acts, I use the symbols I, II, and III to refer to the respective acts.

Sources: <http://www.carouselofprogress.com>; various videos on <http://www.youtube.com>.  
<http://www.yesterland.com/progress.html>  
<http://waitdatedworld.bravepages.com/id215.htm>  
<http://www.davelandweb.com/tomorrowland/carousel.html>

and the elimination of inflight smoking, the experience of airplane travel in a jet aircraft is not noticeably different today from what it was in the 1960s in a 707, although its real cost has fallen. Even widebodies (such as the Boeing 747) date from 1969 (first commercial flight in 1970) (the planes are of course quieter and more fuel efficient).

The big exception to the impressionistic conclusion of little significant change in household life involves the personal computer, the cell phone, and the infrastructures that support them. Sectors producing devices, software, and infrastructural equipment were responsible for a very significant portion of TFP growth in the productivity revival that ran from 1995 to 2005. This is particularly so for the 1995-2000 period. As Gordon and others have noted, particularly between 1995 and 2000, TFP advance was narrowly concentrated within durable manufacturing, and within that sector, within the old SIC 35 and 36 (NAICS 334), the IT producing sectors. Without trying to gainsay the influence of these innovations, one can also argue that the revolution of the last quarter century has been narrower in its impact on household life than was the diffusion of electric refrigerators, stoves and washing machines in the 1930s.

### **Content Analysis: New Products**

I begin by presenting the results of repeat viewings of tapes of Acts I, II, and III, and the various iterations of Act IV, focusing particularly on Acts I-III. I then discuss changes in penetration rates and the evolution of supporting infrastructure. I listened several times to videos of the show, noting some of the variations in the script over time, and in the process developing a comprehensive list of new products mentioned in the script, visible in the tableaux, or both (Table 1). This exercise confirms the validity of

my 1965 impression. There are a large number of new or greatly improved products between 1900 and 1927, and few thereafter.

So it is not accidental that the Carousel of Progress could leave a viewer with the impression of major improvement in American living standards between 1900 and 1927 and little thereafter. The quantitative evidence on productivity growth, real wages and real per capita income, however, suggests continued improvement in the real standard of living through the Depression years and beyond. Evidence on the actual penetration rates of various appliances featured in the various tableaux, as well as their supporting infrastructure helps reconcile this apparent contradiction.

### Plumbing

In Act 1 the paterfamilias raves about the new kitchen pump used to bring water from the well to the kitchen, but acknowledges that the family still needs to keep a bucket of water in the kitchen to prime the pump. He also expresses enthusiasm for the five gallon hot water reservoir in the coal fired stove. In the second act, and all subsequent acts, the household has graduated to hot and cold piped running water and in the 1940s tableaux we see indoor plumbing in the bathroom (at least a sink and tub).

### Lighting

In the 1900 tableau, illumination is provided by piped gas or liquid kerosene, although there is discussion in the script about how Edison is fooling around with “snap on” light bulbs. By the 1920s, and in all of the subsequent Acts, illumination is provided by electrically powered light fixtures, incandescent bulbs in the 1920s, possibly some fluorescents in the 1940s and 1960s, although there is no explicit reference to them.

### Refrigeration

In Act 1 (1900), the family has (literally) an ice box. By the 1920s, and thereafter, the household sports a mechanical electrically powered refrigerator. The 1927 model is a “Monitor top” – so called because of the resemblance of its machinery to the Civil War vessel of the same name. The transition to mechanical refrigeration was a significant change. In the nineteenth century a large infrastructure existed to cut ice during the winter months, and distribute it throughout the year, including the hottest months of the summer, both for use in homes, and to provide the cooling for refrigerated rail cars that revolutionized shipments of dressed beef and fresh fruits and vegetables during the last decades of the nineteenth century. The script in Act 1 mentioned the drip pan for the ice box, which apparently the dog emptied.

#### Food Preparation

In the 1900 diorama the family cooked with a coal fired cast iron stove. By the 1920s, the household cooked with an electric oven and range, as it did in all of the tableaux thereafter. In considering a move away from coal (or wood) fueled stoves, we are not talking simply about a change in appliances. Again, as was the case for nonmechanical refrigerators (ice boxes), an extensive infrastructure existed at the turn of the century to deliver coal to households for heating and cooking. Also visible in Act II are an electric toaster, waffle iron, and coffer percolator. An electric stand mixer is featured in the 1947 Act.

#### Space Heating

A parabolic space heater is evident in Act II under the sink, but is not mentioned. Perhaps surprisingly, none of the Acts makes any explicit reference to central heating.

#### Cleaning

An early version of the Act I script, probably references a “one boy-power” hand pumped vacuum cleaner. An electric vacuum cleaner is featured and comes to life (along with the electric refrigerator and oven) in the 1927 tableaux. The vacuum cleaner, along with the electric refrigerator and the stand mixer, represents the third major application of electric power in the home – the use of small electric motors. A dishwasher first appears in the 1947 tableaux and is visible and explicitly mentioned in the 1967 Act. The 1900 Act displayed a newfangled appliance that reduced the time required to do laundry to five hours (it appears from the nameplate to be an early “Rullman” washer, manufactured in Omaha, Nebraska). The comment is intended to be humorous. Perhaps surprisingly, automatic clothes washers and or dryers, major labor saving devices that lightened the traditional Monday washday routine, are not featured in the current and I believe original scripts for Acts II, III, or IV, although a washing machine is visible in some versions of act III and (in the variant script that played between 1975 and 1994), an automatic clothes washer is mentioned in Act III).

#### Clothes maintenance

A traditional flatiron is seen in Act 1. An electric iron is mentioned in the script for Act II, and can be seen in some variants of the presentation. An electric sewing machine can also be seen in Act II.

#### Entertainment

Forms of Audio and Visual Entertainment are featured in each of the four tableaux. 1900 has a Victrola as well as a faintly off color discussion of the son’s viewing of stereoscopic imagery. In the 1927 Act (version 1) a Crosley radio is featured. In an alternate version of Act II, which apparently is supposed to be earlier in the decade,

a crystal radio is described and shown. 1947 and 1967 feature television, explicitly discussed in the 1947 script. The 1900 script includes a reference to silent films, and in the original version of Act II the father talks about the new film with Al Jolson, in which Jolson talks and sings (it is this reference, along with that to Lindbergh's imminent crossing of the Atlantic, that dates Act II).

### Communication

Telephones are mentioned in the 1900 tableaux, visible in 1927 and in use in 1947.

### Transportation

The 1900 script mentions there are 8,000 automobiles in the country. The father in Act II talks proudly about the electric starter in his Essex. In the original version of Act III the father talks not about automobile hardware per se but about the "rat race" and "commuting", reflecting the somewhat more ironic posture toward all the new technology in this and the last act (jokes about the worthless exercise belt from the 1920s, the use of a stand mixer to blend paint, thus ruining it).

The 1900 script mentions that one can travel by train from New York to California by in 7 days. The 1927 script emphasizes that one can then do so in three days. The 1900 script also includes references to the Wright brothers experiments with flight ("it will never work!") and a reference to electric powered (not horse drawn) trolleys – again perhaps reflecting General Electric's interest in highlighting the many ways in which electric power (in this case for traction) was improving people's standard of living.

A content analysis of the Carousel of Progress visuals and scripts confirms my 1965 impression: not a whole lot new after the 1920s. The big changes between 1900 and the 1920s appear to have been away from hand pumped water, refrigeration provided by ice, cooking heat provided by coal, and interior light provided by gas or kerosene, and towards piped running water, mechanical refrigeration, electrified cooking, and incandescent lighting.

The quantitative record shows, of course, that there has been progress in American living standards through the 1930s, 1940s, 1950s, 1960s, and beyond. It left less of a residue of dramatic new products because it tended to involve a diffusion of technologies and products already visible in the 1920s tableaux to a broader portion of the American population. This process depended upon improvements in infrastructure supporting “modernized” American households, rather than a continued introduction of new systems whereby American households enjoyed water, refrigerated and cooked food, and interior light.

### **Diffusion and Penetration**

We now consider more carefully the penetration levels and diffusion rates of the new products and technologies described above.

#### Water

Acts II, III, and IV of the Carousel feature piped interior hot and cold running water. Act I does not. But a significant fraction of U.S. households already had these amenities (at least interior cold water) in 1900, and even earlier. Lebergott reports that in 1890, 24 percent of all households had running water (58 percent of urban households; 1 percent of rural households) (Lebergott, 1996, p. 101). By 1940, 72 percent of all



housing units had running water (94 percent of urban households, 40 percent of rural) (1948 Statistical Abstract, Table 913, p. 812).<sup>11</sup>

Since there is little suggestion in Act I that we are dealing with a rural household (the script refers twice, in particular, to taking streetcars), the Carousel of Progress gave a misleading impression of the change from 1900 to 1927, since more than half of urban households already had this amenity a decade before the year in which the first Act is set. As far as interior flush toilets (visible in 1927 but not in the 1900 diorama), in 1890 almost half of non-rural (urban) households (46 percent) were so equipped; this figure rose to 82 percent by 1925-26 (Lebergott, 1996, pp. 101-102) (in 1890 only 13 percent of all households had them, largely because they were completely absent from rural housing units).

Again, it is important in thinking about household operation to focus on supply infrastructure as well as the end user appliance or fixture itself. Perhaps as significant as the increase in the share of housing units with indoor plumbing was the fact that the municipal water systems and the quality of water they provided improved greatly in the first third of the century. Consider two coastal metropolises, the San Francisco and New York areas. The damage from fire following the 1906 earthquake in San Francisco was worse than it might have been due to the poor quality of the city's water supply. In 1910 work began on the Hetch Hetchy project, which, over John Muir's strenuous objections, dammed the valley north of Yosemite and built a 200 mile aqueduct to bring vast quantities of high quality drinking water to the Bay Area. It took almost a quarter century (until 1934) to complete the project.

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<sup>11</sup> By 1950 83 percent had either hot or cold running water, and by 1960 that percentage had risen to 93 percent.

New York made similar investments in the initial decades of the twentieth century. Building on its Croton reservoirs, which dated from the mid-nineteenth century, between 1907 and 1924 the city constructed the Catskill aqueduct system, a 162 mile pipe which brought water from upstate New York to reservoirs just north of the city. A series of water tunnels distributed water to the five boroughs. Tunnel 1 was completed in 1917; tunnel 2 in 1935. . Work on tunnel 3 began in 1970 and is expected to be finished a half century (!) later - in 2020.

The extension of indoor plumbing to millions of urban housing units depended upon large, lumpy infrastructural investment. The pipes that deliver running water to kitchen and bathroom are quite often only the exposed tip of far larger systems. I live in Palo Alto, which receives all of its drinking water from the High Sierras. It always impresses me as I fill bottles for backpacking trips in Yosemite, that the water has traveled, by gravity, 200 miles from its source, and now, in a twenty first century version of carrying coal to Newcastle, I will turn around and drive four hours to return it, roughly, to its source. The extension and improvement of water supply systems had significant health benefits, particularly in reducing deaths from typhoid fever.

### Lighting

For most of the nineteenth century, interior lighting was provided by candles, whale oil, coal oil, or kerosene. During the last third of the century some well off households lighted their household with municipal gas (the family in Act I lighted partly with gas and partly with portable kerosene or oil lamps). Kerosene or coal oil burned fifteen times more brightly than candles; gas light was four times brighter than kerosene (Lebergott, 1996, p. 120). Fixtures using chemically impregnated fabric, which incandescenced when

lit, producing a light similar to those produced by propane or vaporized gasoline powered camping lanterns today. In 1900, nine percent of U.S. households got their light from gas, and in fact the penetration of gas lighting continued to grow for decades (Lebergott, 1996, p. 120). These lamps, however, posed a fire, and except in very drafty installations, carbon monoxide risk. They represented an evolutionary dead end in terms of improvements in interior lighting, although the technology hung on resolutely for at least another half century.

In 1882 Edison began producing power at his Pearl Street Station in New York City. Some households switched to electric lights, although marketers had to overcome perceptions that such lighting was “unnatural,” though brighter and safer than gas. By 1920 35 percent of households had electric lighting and by 1930, 68 percent. In 1920 the share of homes lighted by gas and electricity was equal (35 percent), but by 1940 electricity had pulled ahead decisively, although gas lighting was still used in more than a fifth of households (gas, 21 percent, electricity 79 percent) (Lebergott, 1996, p. 113).

In not featuring electric lights in 1900 but showcasing them in 1927, the Carousel is accurately reflecting a major transition. But since a number of low penetration appliances were prominently featured in the 1920s and 1940s tableaux, there would have been solid ground for including electric illumination in 1900 (and of course, even stronger grounds for including running water in what was obviously a well to do middle income family in a nonrural setting). According to Lebergott, three percent of households in 1900 had electric lighting, a higher rate of penetration than enjoyed by the mechanical refrigerators and electric oven/stoves showcased in 1927 or the dishwashers or television featured in 1947. Electric lighting had low penetration in 1900, but it had by that year

gone well beyond being a futuristic bleeding edge (“What will they think of next?”) technology.

By 1927, more than half of America’s urban homes had been electrified (see Tobey, 1996, p. 2), in the sense that they had been wired for illumination. Electric power utilities took advantage of technical innovations in power generation and delivered cheaper power to many more housing units. Farm and rural families were not well served at this time; it would take the New Deal’s public power and Rural Electrification initiatives to extend electrical service to the countryside. But nothing in the Carousel’s acts suggested that the illustrated households were rural. In indicating a move away from candles and oil, the Carousel accurately captured a major change where Americans improved the quality of their life after dark. By 1960 96 percent of all occupied housing units were wired; 87 percent of total units had access to electric power (1967 Statistical Abstract, , Table 1097, p. 729). But the omission of low penetration electric illumination in 1900 and the inclusion of low penetration electric refrigeration and cooking in 1927 exaggerated the qualitative impression of standard of living improvement between those two dates.

In a variety of ways the Carousel also downplayed the continuing role played by gas for illumination, cooking and heating. This is a separate issue, likely related to the fact that the exhibit was sponsored by General Electric. The American Gas Association had a separate pavilion in 1964-65, and in advertisements trumpeted the fact that 78 percent of the air conditioning at the Fair was fueled by gas. But its exhibit did not enjoy the critical and popular success experienced by GE.

Utilities in the 1920s wired new housing units (of which there were millions built) for light, but with the exception of a small number of upper income households, would not provide the full service connections and heavier wiring necessary to support the use of appliances using resistance heating or small electric motors. Utilities believed there was more profit to be had in supplying industrial power – persuading manufacturers that electricity was better than steam, or, even better, for those plants with an on site electric power generation facility, that they could buy central power station electricity more cheaply than they could make their own. Households in the 1920s were perceived as expensive to service. Providing service to consumers entailed more power loss because of longer runs from the central power station, and a need to provide a meter, meter readers, billing and service for customers who, in contrast to industrial or commercial users, consumed small amounts of electricity.

It was only in the 1930s, in desperation, that the utilities turned more seriously to the home market for electric consumption beyond illumination. Several factors conduced to this. Industrial demand declined, and there was little or no growth in traction, as electric streetcar lines stopped expanding and gasoline powered busses emerged as real competitors (electrification of rail lines provided some counterweight). The TVA, moreover, demonstrated the surprisingly large price elasticity of electricity demand, and utilities realized that cheap pricing could be profitable, given this elasticity and economies of scale in central power station generation.

Thus the cornucopia of new electrical appliances prominently featured in the 1927 tableaux was somewhat misleading. Despite initiative among manufacturers both large and small in producing electrical appliances, penetration was low. The market was

constrained by the lack of interest among power companies in extending connections beyond the “light” wiring needed for illumination purposes to the heavier or full connection needed for serious use of appliances. Contributing to this was the fact that appliance sales were dominated by the utilities themselves, who had at best a half hearted interest in extending the market. Mass marketing of consumer appliances, with the exception of radios and small appliances such as irons and toasters, came only in the 1930s.

### Refrigeration

In showcasing a mechanical refrigerator in the 1927 tableaux, the Carousel vastly overstated its level of diffusion or penetration (and the misrepresentation is even more egregious in the 1975-94 variant to the Act II script, which suggested that it is set in 1920 rather than 1927).. There were only 18,000 mechanical refrigerators produced in 1925; only 75,000 in 1927. That compares with over a million phonographs and almost two million radio/phonograph combinations (Historical Statistics, 1960 edition, p. 417). Settling on Freon as the preferred refrigerant did not take place until late in the decade. In urban settings, many households did without refrigeration entirely, relaying on daily shopping for food purchases. I lived almost an entire year in London in 1970-71(pursuing a masters at the London School of Economics) in a bed sitter with a window box exposed to the external air with a sliding door for interior access. In 1927, only 40 percent of U.S. households had refrigeration, and almost all of this was ice – as depicted in the 1900 tableaux. Only 17 percent of household took ice deliveries year round (Tobey, 1996, p. 18).

Most of the mechanical refrigeration market in the 1920s was industrial and commercial – typically walk in installations utilizing powerful motors. In the mid 1920s domestic refrigeration suffered because of a lack of R and D devoted to the fractional horsepower motors needed, continued problems with leaking and potentially toxic refrigerants, large pre and post installation service requirements, and high prices. In 1926 there were 95 different manufacturers of refrigerators, many with production runs under 25. This was still a boutique market for upper income households, that could not go mass market until production became concentrated enough to reap economies of scale in manufacture and the devices became reliable enough to be sold “off the shelf” by retailers without extensive preinstallation “tuning” (Tobey, 1996, p. 19).

The diffusion of mechanical refrigerators was further forestalled by improvements in traditional iceboxes – including much better insulation. Like sailing ships facing increased competition from steamships, the ice industry and the boxes it supplied did not go quietly into the night. Still, mechanical refrigeration, when it worked, promised better temperature regulation, and one was no longer faced with the chore of emptying the often foul smelling drip pan.

### Cooking

The 1927 tableaux also suggested a much broader diffusion of electric powered cooking than had actually taken place by that date. It is true that the coal or wood fired range was on the way out, at least among urban consumers. But in 1930, 13.7 million households used gas to cook, as opposed to less than a million using electric “fuel” (Tobey, 1996, p. 24). In 1940 16.8 million cooked with gas vs. only 1.8 million with electricity. Almost 4 million households still cooked with coal, and over 8.1 million with

wood; 3.3 million used kerosene or gasoline (1948 Statistical Abstract, Table 914, p. 813).

The use of resistance heating for cooking faced a number of obstacles. First, engineers needed to determine the right alloys with which to make metal filaments that would get hot without burning up (and out). In 1905 Albert Marsh developed a nickel-chromium alloy that served well enough, but was subject to oxidization. In 1915 Charles Abbot at GE settled on a steel-aluminum alloy that did not suffer from the oxidization problem. But it was not until 1928 that GE introduced this innovation, marketing it as the Calrod element. In 2010 I replaced an element on our GE electric stove. It had the familiar Calrod disk in the center, as did the element it replaced, and as far as I can tell, is little changed from the elements that the company began to sell in 1928.

The other problem that blocked the more widespread diffusion of electric cooking, aside from the fact that temperature control is poorer than with gas, is that few houses had adequate wiring to support it. It was only after the war, with more housing units with adequate wiring to power them, that cooking with electricity began to catch up with gas. In 1950, 6.404 million households cooked with electric “fuel” vs. 25.502 million with gas. In 1960, the numbers were 16.351 million electric vs 33.787 million cooking with gas. In 1960 those cooking with gas still dominated electricity users 2 to 1 (1967 Statistical Abstract, Table 1096, p. 729).

### Space Heating

As noted, a portable electric space heater is visible under the sink in Act II of the Carousel, but is not discussed. A curious omission from the Carousel is any discussion of space heating, even though central heating resulted in a major improvement in the quality



of American household life. By 1940 42 percent of U.S. households had central heat, including 58 percent of urban households (1948 Statistical Abstract, Table 914).

Traditionally, with either portable or stationary units, electric space heating is provided by resistance heating, which tends to be quite expensive except in places such as Quebec, which enjoys very cheap hydro power. Although there is some market for electric water heaters, there is essentially none for circulating hot water systems or forced air systems warmed by resistance heating, because it is so expensive. When the exhibit was being developed, GE, the corporate sponsor, had not yet geared up, along with utilities, to make a full court press in the 1970s (a new challenge for Reddy Kilowatt) to get households to heat with electric baseboard heaters. Between 1970 and 1978 the percentage of new housing units heated with electricity rose from 28 to 52 percent, while those heated by gas fell from 62 to 37 percent. Still, only 6.5 percent of occupied units were heated with built in electric units in 1977, and the percent of new housing units with electric heat had fallen to 27 percent by 2001 (1979 Statistical Abstract, Table 1375, p. 781; Table 1377, p. 788; 2002 Statistical Abstract, Table 922, p. 591.)

Electric baseboard heaters do not in fact, represent central heating. They are distributed units, essentially stationery electric space heaters, and proponents emphasized that they allowed individual temperature control in different rooms (better zonal control). Electrically powered heat pumps, on the other hand, which began to be installed in larger numbers in new housing in the 1980s, can be used in forced air systems as part of a true central heating system. Heat pumps, a reverse form of air conditioning, use an electrically powered compressor to suck heat out of the air or ground (and by reversing their operation, can also provide Air Conditioning in warm periods). The development

and promotion of heat pumps with high coefficients of performance, in contrast with the expensive and inefficient use of resistance heating, is relatively recent.

In 1960 only 2 percent of US household heated with electricity; a decade later the figure had risen only 8 percent (Lebergott, 1996, p.107).<sup>12</sup> In 1940, more than half of American households (55 percent) still heated with coal; 23 percent used wood. The remainder was split equally between oil and gas (11 percent each). At least until the 1970s, central heating was almost entirely a story of coal, gas, or fuel oil. At the time the Carousel scripts were developed, space heating simply did not fit as well into the electrification narrative that was so central to the show's message.

### Clothes washing

There is not much mention in the Carousel about clothes washing, save the humorous reference in the first Act to a hand operated labor saving invention, “a washday marvel” that reduced the number of weekly hours consumed by this chore to five. Mechanical clothes washers diffused slowly in the United States, and were often paired with a separate hand operated wringer (the machine in Act I does not have one). Early powered machines often used sputtering one cyclinder gasoline engines, so that their market was not restricted to households with electrical connections, particularly in rural areas.

Slow diffusion also reflected the continued fierce competition of commercial laundries or in house laundresses – occupations dominated by blacks in the American South and Chinese elsewhere. The use of commercial laundries remained high among all social classes through the Depression years. Bowden and Offer (1994, p. 729) identify

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<sup>12</sup> Lebergott's numbers are higher than the data in Statistical Abstracts because he includes all electric heating, whether provided by portable or stationary units.

1936 as the year of 50 percent washing machine penetration of wired households; with 75 percent penetration in 1950. This is consistent with data for 1953 showing 76 percent penetration (1967 Statistical Abstract, Table 1097, p. 729). It is important to keep in mind, however, that these data do not differentiate between fully automatic washers, and those requiring that wet clothes be fed through a wringer (called a mangle in the U.K.) in preparation for drying. Wringers, either hand or electrically powered, were quite dangerous.

The diffusion of large, difficult to move, and expensive labor saving appliances was also hampered by the large fraction of households renting. Such households could not have confidence they would be able to use their appliances in a new residence, because of the cost of moving them, because they might not fit, or because the new residence might not have the heavy wiring and full electrical service necessary to operate them. Housing tenure discouraged households both from buying large electric appliances and from making investments to upgrade the wiring in their residences that might be necessary to accommodate them.

Again, it is important to distinguish between electrification and wiring and electric supply sufficient to accommodate a full range of electrical appliances. During the housing boom of the 1920s most new housing units were “electrified”, but they were wired for illumination only. Indeed, the 1927 tableaux indirectly refers to this, since in Act II the narrator blows a fuse (and indeed shuts down electrical service for the entire neighborhood) by plugging in too many appliances. There are wires screwed into many light fixture sockets, leading all over the house, creating a spaghetti-like net. The father

notes proudly that “we can run as many wires as we need in any direction for mother’s new electrical servants” at which point the lights dim and the wires glow in bright colors.

In 1927 there were still many obstacles to the diffusion of electrical appliances beyond lights. Some houses, of course, simply had no wiring. Many others had wiring suitable for illumination only. A smaller group had “convenience outlets,” our now familiar wall sockets, which had heavier gauge wire to service small electric appliances. And a still smaller group had the heavy duty wiring, possibly with higher voltage (220 volts) necessary to safely drive resistance heating devices like stoves, ovens, or water or space heaters. Houses lacking convenience outlets forced users to connect appliances using screw in connectors to light bulb sockets, as seen in Act II. This meant that waffle irons and toasters were often fed by wire of too small a gauge to service the appliance safely.

In the mid 1920s, electrified housing units had an average of only three wall outlets. Since building codes typically mandated only one ceiling fixture per room. The first priority for these wall outlets typically were floor lamps, which left no power source available for appliances. Tobey concluded that in the 1920s, two thirds of U.S. households were technologically incapable of being modernized simply by purchasing the requisite electrical appliances. By the end of the 1930s, thanks largely to New Deal initiatives, the situation was reversed, with roughly two thirds of the housing stock with adequate wiring and power supply to take both illumination and the standard household appliances (Tobey, 1996, p. 33).

Automobile:

The script for Act II mentions the household's possession of an automobile with a self starter. This is an interesting point. Prior to the 1920s electric automobiles competed aggressively and successfully with external combustion (steam) and internal combustion (gasoline) models. Roads were poor and trips short, which played to the advantages of electric cars. Lead acid batteries were as powerful then as they are now; little technological improvement has taken place in these storage devices for almost two centuries. Electric cars dispensed with gear boxes, clutches, and did not require the skills involved in driving a shift vehicle. Perhaps more importantly, in contrast to gasoline powered vehicles, they did not need to be cranked to get them going, a huge marketing advantage, particularly from the standpoint of women.

Paradoxically, the development of the electric starter, a motor using battery power to turn over the engine, compressing vaporized fuel in the pistons and allowing a process of internal combustion to begin, played a major role, along with better roads enabling longer trips, in the loss of market share for electric vehicles. Since gasoline technology ultimately triumphed, and central power stations were not to be in the business of providing electricity to recharge the batteries in hundreds of thousands of vehicles, GE's interest in highlighting this chapter of the electricity narrative may have been mixed.

Unlike the mechanical refrigerator, the automobile had by the end of the 1920s become a mass market product. Over 4 million vehicles were sold in 1929, most of them gasoline powered, a record not equaled again until 1949. Between 1921 and 1929 inclusive, almost 27 million vehicles were purchased, just shy of the number of households in 1929 (29.5 million). Lebergott shows automobile penetration rising from 26 percent of households in 1920 to 60 percent in 1930, declining slightly during the

Depression years. (1996, p. 130). Among durables, only the radio industry sold more units in 1929 than did automobile manufacturers.

A final point about the automobile. The censuses of housing distinguish between rural farm, rural nonfarm, and urban dwellings. It is clear from the script and the views out the windows that the households in each of the Carousel's four acts are not rural. It is also apparent, certainly for Acts 1, III and IV that they are not apartments. They are likely single family detached structures – houses -- and most likely owned, since the characters are shown taking great pride in their appliances and, in at least one of the acts, engaged in a remodeling project.

Acts I and II look to be set in a small town or city. Acts III and IV are clearly suburban. It was the automobile and the associated infrastructure of streets and highways, gasoline supply, and repair facilities that fueled this shift, which enabled a growth in the proportion of single family detached structures. By the 1960s the suburban house was the modal housing unit for the United States, a transition that was beginning to happen in the 1920s. Although automobile penetration actually fell slightly across the Depression years, the build out of the surface road network increased vehicle utility, particularly for longer distance travel, and laid the groundwork for explosive suburbanization after the war. These developments were arguably as significant as the big advances in the percentage of households with cars during the 1920s. This is another reminder of how important it is to look not solely at the features of a consumer durable, but also at the infrastructure that complements and supports it.

### Radio

Radio broadcasts began in the United States in 1921. Early radios, however, were battery operated crystal sets, listened to with headphones with as little as 40 hours use before they had to be recharged at the retailer. By the end of 1925, manufacturers had placed less than 3 million sets in American households, even though diffusion was not constrained by availability of a wired connection. In 1925, however, a coalition of ten manufacturers began selling sets with all components in an enclosed cabinet, with power provided from house wiring. The FCC changed rules on licensing spectrum to reduce overlap and allow clearer reception. Legislation also forced RCA to license its patents. Radio sales took off, fueling the meteoric increase in the price of RCA stock. By 1927, and particularly by 1929, the radio had, like the automobile, become truly mass market. By 1931, three quarters of wired households in the United States had radios (Bowden and Offer, 1994, p. 729).

Radios were voracious consumers of electricity, and began to turn households owning them into the same. Radios drew more power than lightbulbs or electric irons, and more even than vacuum cleaners or clothes washers. Their use helped pave the way, by encouraging wiring upgrades, for the diffusion of mechanical refrigerators and electric ovens and ranges.

### Cleaning

The Carousel devoted relatively little attention to house cleaning. A “boy powered” hand operated machine is displayed in an early version of Act I. The vacuum cleaner was one of the most visible of the electrical appliances coming to life in the initial and current versions of Act II. Bowden and Offer identify 1913 as the year in which vacuum cleaners reached 1 percent penetration of wired households (1994, p. 729).

According to Lebergott, 9 percent of American household had one in 1920; 30 percent by 1930, and 54 percent by 1950. The Carousel script neglected to emphasize one of the biggest benefits of a shift over from coal fired heating and cooking: a reduction in the production of soot, which complicated the task of keeping a household clean.

## **Conclusion**

Regardless of what Disney intended, the Carousel of Progress leaves a viewer with the strong impression that revolutionary change occurred in the American household between 1900 and 1927, with relatively little advance thereafter. A more systematic examination reveals the ways in which the exhibit both captured essential features of reality and distorted it. More than half of urban households in 1890 – ten years before Act I, already had running water. And 3 percent of households at the turn of the century had electric lights. The emphasis on a shift to electric illumination between 1900 and 1927 is historically justified. On the other hand, a very small fraction of American households had mechanical refrigerators or cooked with electricity in 1927. The inclusion of low penetration appliances in the 1927 diorama, along with their omission, along with running water, in 1900, tends to exaggerate the changes between the two periods. We can conclude that the Carousel was, overall, mixed in its historical accuracy, not in the nature of the artifacts (appliances) highlighted, but on what the exhibit implied about levels of penetration and rates diffusion.

Indeed, there is a strong case that if there was a consumer durables revolution, it was as much the creature of the New Deal as it was of the roaring twenties. Roosevelt's simultaneous push for a national housing policy, cheap electric power (most effectively realized in the TVA), and rural electrification helped create a mass market for key



consumer durables that in the 1920s remained largely a boutique product. It is fair to say that during the twenties the automobile, the radio, the electric iron, and the vacuum cleaner all became mass market items. But it was only in the 1930s that the mechanical refrigerator, the electric range, and a variety of other electric powered durables achieved high rates of penetration. The transition from the 1927 to the 1947 tableaux, continuing into the postwar, was in many ways as important as that taking place between 1900 and 1927, even though it was reflected less in the introduction of brand new products and more in their diffusion to a broader fraction of American households.

## REFERENCES

- Bowden, Sue and Avner Offer. 1994. "Household Appliances and the Use of Time: The United States and Britain Since the 1920s." Economic History Review 47 (November): 725-48.
- Bresnahan, Timothy and Manuel Trachtenberg. 1997. "Quality Adjusted Prices for the American Automobile Industry: 1906-1940." In Timothy F. Bresnahan and Robert J. Gordon, The Economics of New Goods. Chicago: University of Chicago Press, pp. 71-108.
- Brown, Clair. 1994. American Standards of Living: 1918-1988. Cambridge: Blackwell.
- David, Paul and Gavin Wright. 2003. "General Purpose Technologies and Surges in Productivity: Historical Reflections on the Future of the ICT Revolution." In Paul A. David and Mark Thomas (eds.), The Economic Future in Historical Perspective. Oxford University Press, 2003, pp. 135-166.
- Field, Alexander J. 2010. A Great Leap Forward: 1930s Depression and U.S. Economic Growth. New Haven; Yale University Press (forthcoming).
- Gordon, Robert J. 2000. "Does the New Economy Measure up the Great Inventions of the Past?" Journal of Economic Perspectives. 14 (Fall): 49-74.
- Gordon, Robert J. 2004. "A Century of Downward Bias in the Most Important Component of the CPI: The Case of Rental Shelter, 1914-2003." (working paper).
- Lebergott, Stanley. 1996. Pursuing Happiness: American Consumers in the Twentieth Century. Princeton: Princeton University Press.

- Mokyr, Joel. 2000. "Why "More Work for Mother?" Knowledge and Household Behavior, 1870-1945." Journal of Economic History 60 (March): 1-41.
- Mokyr, Joel and Rebecca Stein. 1997. "Science, Health and Household Technology: the Effect of the Pasteur Revolution on Consumer Demand," In The Economics of New Goods, eds Robert J. Gordon and Timothy Bresnahan, Chicago: University of Chicago Press and NBER, pp. 143-205.
- Olney, Martha. 1991. Buy Now, Pay Later: Advertising, Credit and Consumer Durables in the 1920s. Chapel Hill: University of North Carolina Press.
- Rostow, Walt W. 1960. The Stages of Economic Growth: A Non-Communist Manifesto. Cambridge: Cambridge University Press.
- Tobey, Ronald C. 1996. Technology as Freedom: the New Deal and the Electrical Modernization of the American Home. Berkeley: University of California Press.
- United States Bureau of the Census. 1960. Historical Statistics of the United States: Colonial Times to 1957. Washington: Government Printing Office.
- United States Bureau of the Census. 1949-2004. Statistical Abstracts of the United States, 1948, 1955, 1963, 1965, 1967, 1969, 2001, 2003. Washington: Government Printing Office. Available at [http://www.census.gov/compendia/statab/past\\_years.html](http://www.census.gov/compendia/statab/past_years.html) .
- Vanek, Joann. 1980. "Time Spent in Housework." In Alice Amsden ed., the Economics of Women and Work Harmondsworth, pp. 82-90.
- Vatter, Harold G. 1967. "Has there been a Twentieth-Century Consumer Durables Revolution?" Journal of Economic History 27 (March): 1-16.

Internet resources:

Videos:

<http://www.youtube.com/watch?v=KKz6qdexetY> (includes updated Act 4)

Scripts, pictures, commentary:

<http://www.carouselofprogress.com/The%20Carousel%20of%20Progress%20dscript1.htm>

<http://www.yesterland.com/progress.html>

<http://waltdatedworld.bravepages.com/id215.htm>

<http://www.davelandweb.com/tomorrowland/carousel.html>