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DELIVERING PAPERS

Henry Petroski

No activity or occupation is without its unique technological problems and solutions. Yet the problems often go unnoticed by the uninitiated; long-standing solutions can be underappreciated even by those steeped in the technology; and to virtually all of those practitioners who daily rely on clever tricks and devices to get even the simplest of jobs done, the inventors and engineers of quiet revolutions usually remain anonymous and unheralded.

Delivering a paper at a professional meeting, which presents the problem of displaying information so everyone attending can see it, involves a host of anonymous technologies. How many know who invented the 35-millimeter slide or the overhead transparency and their associated projectors? Slide shows are being superseded by computer-based PowerPoint presentations, of course, but the newer technology and its supporting infrastructure are likewise largely anonymous contributions.

During most of my teenage years, I was occupied with delivering papers of a different kind. And the activity involved a whole set of other associated technologies. My job was straightforward in concept: Late every afternoon and early every Sunday morning, it was my responsibility to pick up about 100 copies of the Long Island Press from the district circulation office and deposit them on 100 different stoops on my paper route in the suburban New York neighborhood in which I lived. I was a paperboy.

Delivery trucks brought the papers from the printing plant to the circulation office in bundles of 50, with each bundle encircled by a length of wire whose ends were twisted together so tightly as to cause the wire to dig into the edges of the outside papers of the pile. Once the wire cinch on the bundles was cut and my exact allotment of papers was counted and recounted, I was on my own. But the pile of flat papers was seldom just plopped into the delivery basket on the front of my one-speed Schwinn bicycle with its balloon tires and coaster brake. The papers first had to be processed, rearranged, reshaped in such a way that made them convenient to transport to and deliver on my route.

The immediate technological problem was to take the pile of papers and transform it into a collection of individual packages that not only would fit into the bicycle basket but also would stay put in there over the mile or so of hills, curbs and turns that I had to negotiate before even reaching my paper route. Then the papers had to be able to withstand the sometimes violent forces associated with being thrown from a moving bike onto a stationary stoop. The technological solution was embodied in the folded newspaper, a paperboy's godsend invention that was at the same time immensely simple and incredibly complex. Yet the folded paper was so much a part of the culture of the Press office that it seemed not to have occurred to any of us to ask, Who had first come up with What idea? and When? and Where? Neither did we ask Why? Yet unlike the answers to the first four newspaper Ws, the answer to the fifth, Why? was obvious to any paperboy.

Humble Beginnings

Newspapers of all shapes and sizes were delivered by young boys long before the bicycle existed, so for quite a while it was necessary to carry the supply of papers in some elementary way. The most elementary means was, of course, under one arm, which gave rise to the classic pose in which newsboys who cried "Extra!" on street corners have been depicted to the point of cliché. Although a young hawker could hold only so many papers under his arm, he could keep a larger supply near to his sidewalk place of business and so replenish his armload at will.

For the paperboy who walked a subscription route, the solution was not so simple. Many a young entrepreneur would no doubt have aspired to delivering more papers than he could carry under his arm, and so he might have employed a wagon or some other mechanical advantage to increase the quantity that he could transport. The standard device came to be the

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Figure 1. No less than Thomas Alva Edison got his start selling newspapers and sundries on Michigan passenger trains. From such beginnings have come many an engineer—even bridge builders. (Photograph courtesy of Tony Pitts, the Port Huron Times Herald.)

newspaper delivery bag. This oversize canvas bag was fitted with a shoulder strap, which enabled a boy to have his two hands free to place the papers under welcome mats or inside doors. The newspaper boy on foot in knickers and cap, with his delivery bag hung from his shoulder, was an icon of early 20th-century America.

One explanation of the origin of the folded newspaper is that the adoption of the newspaper bag freed up a paperboy's two hands so that he could fiddle with a paper as he walked from house to house. Out of such play, the folded newspaper was invented. By folding a newspaper into a compact form less susceptible to being blown away in the wind, the boy was able to toss the paper more casually onto the porches and stoops of his subscribers, thus completing his route more quickly. In a 1930s association handbook, the Newspaper Boys of America made clear that to be considered an accomplished newspaper carrier, a boy had to know how to "properly fold papers while walking his route."

An alternative explanation, which I prefer for the origin of the special fold that I learned as a paperboy, has the invention at least being perfected when paperboys began to deliver from bicycles. Although a boy on foot could carry several times as many papers in a bag over his shoulder as under his arm, he still had to walk by each house and deposit the paper in an appropriate place. Because he was a pedestrian, he could walk across lawns and so reduce the distance he had to toss a paper. Any fold that he used did not have to be very robust.

The pedestrian method worked fine in cities and towns where houses were close if not attached, where lawns were nonexistent or small, and where subscribers were generally located within a short distance of one another. The widespread development of suburbs in the postwar years, however, saw the near extinction of the paperboy walking his route. Houses set back from the sidewalk, and separated from their neighbors by driveways and lawns, added distance to a paper route. Although many a paperboy would naturally have walked across the grass, that was not a viable option where there were fences and hedges or, worse, forbidding neighbors and unfriendly dogs. The bicycle naturally shortened the time, if not the distance, to deliver in the suburbs. The standard image of the paperboy then became one of a boy with a bag hanging from one shoulder and pedaling his bike down a tree-lined sidewalk.

A paperboy, like any businessperson, always wanted his business to grow. This meant carrying more papers, of course, but the delivery bag could only be packed with so many before it became too heavy and cumbersome to deal with. Riding a bike with a bulky bag of papers hanging to one side was not easy; installing a large delivery basket over the front wheel of the bike helped immensely, especially since a day's papers could weigh as much as 50 pounds. With the load centered over the front wheel, riding and steering the bike became much less difficult.

The paperboy still had to get the papers from his bike to the subscriber's stoop, something that could be done in several different ways. He could park the bike against a tree, take a number of papers under his arm, walk past the stoops, dropping a paper here and there, and return to the starting point. Or he could carry a lighter bag of papers, folding them as he walked along. If his bike had not fallen over in the meantime, spilling the main bag of papers all over the sidewalk, the paperboy could return to it and just ride to another conveniently located tree and repeat the process. In addition to the risk of falling bikes and spilled papers, this method meant a route took a lot of time to complete. How nice it would be, many a paperboy must have thought, if he could just stay on his bike, ride it past the houses on his route and drop the papers onto the appropriate stoops.

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Newspaper as Projectile

Many a paperboy also wanted to finish his route quickly so that he could join the football game in the sandlot or the stickball game on the street. If only he could throw a newspaper as he did a ball! Perhaps then he could toss a paper from a moving bicycle—and even hit the target nine times out of ten. How different would this be from passing a football? But even the smallest newspaper was too thick to wad up like a piece of writing paper and toss at a target, and no customer wanted to have to unwrinkle the evening's news (although some dandies are thought to have had their servants iron the evening paper). But folding a newspaper into a compact package did hold promise for its speedy delivery.

The Long Island Press was a full-size newspaper, like the New York Times and most other newspapers today. In format it was what the British call a broadsheet, as distinguished from tabloids like the New York Post or Daily News and the sensationalist weeklies that we encounter at supermarket checkouts. Because the printed sheets of a larger-format newspaper are folded twice as they come off the press, they have two closed and two open edges, rather than the one closed and three open edges of the tabloid. It is this distinction that enabled the broadsheet to be folded further by the paperboy to make a package effective for tossing from bicycle to stoop. Folding the paper in half and then in half again gave it the aspect of a club, but the paper wanted to unfold itself. Folding the paper in thirds gave it a sleeker profile, but it still wanted to unfold and assume its flattened shape. And neither folding method held the paper together for airborne delivery.

Folding the broadsheet paper into thirds did, however, present a new possibility, for the loose edges on the right of the paper could be overlapped by the closed edges on the left. Furthermore, if instead of being overlapped, the loose edges on the right were tucked into the pocketed ones on the left, then the folded paper might stay closed all by itself. The paper thus folded also had the heft and stiffness of something more suitable for throwing from a bicycle onto a stoop.

Just throwing it as if making a shovel pass with a football resulted in little yardage, however, and the paper tended to land at best midway up the walkway. Giving the paper a rotation, like that given a knife or tomahawk thrown at a target, did add distance and accuracy, but at the expense of integrity. The violence of "the flip," as the action came to be known among paperboys, often resulted in an improperly secured paper catching the wind and separating into loose sections.

The solution to the problem of folding newspapers like the Press must have been clear to at least one paperboy who dreamed of a way of obviating the embarrassment of the paper flying apart in the air. If, after folding the paper in thirds and inserting the one side into the other, but before flattening the resulting tube, it was rotated through 90 degrees and creased, the now-crooked tail end was better secured into the mouth end. Furthermore, by crushing the tube and giving it a kink with the tips of the fingers, the loose ends were locked into place as firmly as a stripped wire crimped into an electrical fitting. In the hands of an experienced paperboy, flipping a paper so folded promised a high probability of its hitting the stoop intact. This was the technology that I inherited when I began my first paper route in 1954. (Other paperboys, I imagine, may have prepared and carried their newspapers and delivered their routes in different ways, for there is no unique solution to any technological problem. However, I cannot imagine a more elegant solution for getting the paper from a bike speeding along the sidewalk to a distant stoop.)

In addition to perfecting the fold, the ancillary development of folding all of the papers before starting out on the route was essential to a paperboy's efficiency. By folding them the way we did, and by packing them tightly, it was possible to fit an enormous number of papers into a stretchable canvas newspaper bag and hence onto a bicycle. Although the bag so packed was swelled to dimensions well beyond those of the delivery basket, it was possible to transport it. As long as one edge of the bag could rest in the basket proper, with the bag's strap secured around the handlebars, the load could be carried with confidence. On Sundays, when the thick papers could barely be squeezed into two bags, the practiced paperboy, full of hubris, could even balance one on top of the other and negotiate his way to his route. He did so by looking around the load that loomed over his head, the way he saw his father drive a car with an iced-over windshield by hanging his head out the side window.



Figure 2. One explanation for the origin of the folded newspaper hinges on the development and adoption of the newspaper bag, which freed up the paperboy's hands for new tasks. By folding the paper, the deliverer was able to toss it onto the stoop, rather than having to secure it under a doormat, thereby speeding his journey. (Photograph by the author.)

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Figure 3. To form a projectile suitable for tossing from his Schwinn, the author learned to fold a paper in thirds and insert one side into the other. Before the resulting tube was flattened, it was rotated through 90 degrees and creased, locking the sides together. Such functional origami still fascinates today. (Photograph by Catherine Petroski.)

On to Obsolescence

The paperboy's adaptive behavior, so common in the 1950s, is seldom seen in suburban neighborhoods today. The afternoon paper has all but disappeared, and growing affluence and academic pressures mean that fewer young boys and girls are available to fold and flip papers after or even before school. The morning paper continues to be delivered to our homes, but delivering newspapers has increasingly become the job of adults, or at least older teens with automobiles. This means that the size of the route is no longer limited by how many bags of papers can be balanced on the front of a bicycle. A car's back seat can accommodate hundreds of prepared newspapers, which can be tossed out the windows of the moving car. At the same time, houses and lots have become larger, and, at least in name, the stoop has evolved into a porch located at some distance from the street, and so in the suburbs the paper is now just dropped or tossed at the foot of the driveway.

When newspapers were no longer packed into canvas delivery bags for long-distance flipping, the locked fold of the newspaperboy soon became obsolete. For suburban delivery, at least, papers came to be simply folded over two or three times, or rolled into a spiral and bound with a rubber band. Plastic bags began to be used on rainy days to keep the paper dry, and in many locations the plastic bag completely displaced the locked fold and even the rubber band to hold the paper together. (In most rural areas, lock folding, rubber bands or plastic bags are not necessary, because the paper is slipped into an open-ended plastic tube affixed beside the mailbox.)

But even the act of inserting a newspaper into a plastic bag can be done with style and finesse. The anonymous person who delivers our paper now tucks the open end of the plastic bag back into the creased paper inside and thus into itself, presenting a neat package with no loose or flapping ends. When prepared this way, the paper must be easier to grab from the car seat and flip out the open window. I surmise this because, when I have been awake at four or five in the morning, I have often heard the sounds of this newspaper delivery person's car zigzagging down the street in low gear. In the plop, plop, plop of plastic-sheathed papers landing flat on the driveways, I have detected a rhythm that I had not heard since my own newspaper-delivery days.

Whether motorized or not, the technological details of the process of delivering newspapers are of distinctly human scale. The problems that process presents and the solutions that nameless participants have devised may never be taught in schools of engineering or celebrated in inventors' halls of fame, but they embody the essence of any invention or technological process that has evolved over time. Just as the technique of delivering newspapers has changed in response to the pressures of such factors as size, speed, economy, function and even fashion, so do all technological processes, products and systems evolve under changing conditions.

Although it has been years since I have seen a newspaper folded the way I did it as a teenager, I am still often reminded of the skill in many different contexts. When I check into a hotel room, more often than not I find the washcloths formed into flowers or other decorative forms to hold the soap and toiletries, or just to sit neatly beside them. I am also reminded of folded newspapers by the elaborately and sometimes mysteriously folded napkins waiting on set tables in a restaurant, ready to be placed on the lap of a diner. To me, a napkin on a place mat is like a newspaper on a welcome mat, ready to be picked up and spread open before dinner. A few months ago while staying in the Stanford faculty club, I saw through the window of one of its banquet rooms a group of waiters sitting around a large table folding napkins for a function that evening. As repetitious as the chore was and as ephemeral as its product would be, they were clearly enjoying the group activity and talking and laughing as their hands mechanically turned plain starched linen into birds of paradise. It was as if I were looking in on the circulation office where more than four decades ago I stood among my fellow paperboys at a folding bench turning the flat black-and-white broadsheets into kaleidoscopes of news.

No matter how done, just as the arranged napkin has to rearranged to be used, so the folded newspaper had to be unfolded to be read. Indeed, so many items of commerce packed with uniform neatness for shipment and display have to be undone to be used.

I was reminded again recently of the self-contained nature of the folded newspaper when I opened a new shirt. Not one pin and only a sin-

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gle plastic clip held the shirt in its display configuration. To my surprise, the shirt was folded in such a way that the tail was tucked neatly and securely into the rest of the garment, holding the sleeves inside, and the whole package was as tight and compact as it must have been the day it left Hong Kong. (While staying in a New York hotel recently, I found the laundry bag was folded in a similar way, making for a package as neat as the well-appointed room.) I admire all instances of such functional origami.

There are countless other quotidian technologies that hardly call attention to themselves and yet are capable of providing insight into how even the most esoteric of technologies can evolve over time. When I was growing up, the mailman came twice a day, every weekday, through rain and wind and snow. He carried a leather mailbag over his shoulder and delivered letters, sometimes addressed by name and street only. When his bag was empty he picked up some more mail from a nondescript olive-drab drop box where a Post Office truck had dropped it off. After a while, the mailman began to carry a heavier mailbag on a wheeled device, thus lessening his dependence on drop boxes, and came to deliver only once a day. (And the famous slogan notwithstanding, during one major snowstorm in North Carolina, the mailman did not come for days.)

All the mail that a mail carrier will deliver in a day is now piled into a quiet electric truck, which is driven up and down driveways. One of our mailmen used to stop his truck at the base of our driveway to pick up the newspaper that we had not brought in that morning and bring it with the mail to our box. It reminded me of the paperboy's competition with the mailman for room in the mail slot or mailbox on rainy days. Now, when new people move onto our city block, they must install a rural-type mailbox at the curb, so that the mail carrier does not have to get out of the truck to leave the catalogs and magazines and newspapers from afar. There is no technology, no matter how elementary, that does not change.

Although the technologies of delivering newspapers, folding napkins, delivering mail and doing everything else—large and small alike—have evolved with time, most of us still have a strong sense of nostalgia for the way things were done during our formative years. The technologies of those days remain our paradigms for invention and enterprise. I may not have fully appreciated as a teenager that everything then was part of an evolving technological system. But I have come to see in retrospect that taking care of my bicycle, preparing and delivering newspapers, and just being involved with the world of things marked me even then as a future engineer. Often I find myself seeing invention, engineering and technology through the tube of the newspapers I folded and the whir of the spokes of the spinning bicycle wheel that I maintained as a boy.

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