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Carinthians are grateful to the United States of America and to President Woodrow Wilson, as well as to his experts at the Paris Peace Conference after World War I, for their role in bringing about the plebiscite of October 10, 1920, seventy-five years ago. We are especially grateful to Professor Archibald Cary Coolidge.

After World War I and the collapse of the Austro-Hungarian Empire, the newly established kingdom of the Serbs, Croats, and Slovenes, that is, the first Yugoslovia, claimed all of the Slovenes of southern Carinthia. The disposition of the so-called Klagenfurt Basin, inhabited by a mixed German and Slovene population, was consequently one of the territorial issues that the Paris Peace Conference had to resolve.

Much debate resulted in the plebiscite solution, which was due to President Wilson and especially to his experts Professor Coolidge and Lt. Colonel Sherman Miles. The plebiscite turned out to be favorable to Austria. The Karawanken mountains, southern border of the old crown duchy of Carinthia, became the border of the Austrian republic.

The southeastern part of the country, the area where the plebiscite took place, contained a population that was about 70 percent Slovene in language. Yet, Austria gained 59 percent of the total vote, and of the 22,000 persons who voted to join with Austria, 10,000 were Slovene speaking. By their own decision, they became part of a German-speaking state.

Although the treaties of Paris provided for minority rights, in the tumultuous times between the wars, and during World War II itself, many things that should not have been done were. However, since 1955, when Austria regained her freedom, Carinthia has achieved much in guaranteeing rights for her Slovene minority.

The people of Carinthia are grateful to Professor Archibald Cary Coolidge for his help in bringing about the plebiscite of October 10, 1920.

After the ceremony in the Widener Memorial Rooms, members of the Austrian delegation entered the stacks and walked down to D West, the bottommost level where the Aus class is shelved. There, they saw a considerable number of books and periodicals about Carinthia. On the way out of the stacks, the Deputy Governor commented, "I never expected to find here books about Carinthia."

I did, though, and that is why I was able to volunteer to take the delegation into the stacks. I knew the books would be there, because I knew that Archibald Cary Coolidge would have seen to it.

Coolidge, back in the early years of this century, understood that Americans would help to shape events in places whose very names were unfamiliar to all but a few of his fellow citizens. Through his teaching, through editing *Foreign Affairs*—and through giving a worldwide scope to the Harvard Library—he sought to insure that Americans would act on the basis of knowledge.

Although Coolidge bought 4,000 volumes while in Austria, some of the books about Carinthia were in the Widener stacks before he left Cambridge on his mission. Perhaps the history of Carinthia was even shaped by some of those books that are now on D West.

Technological Advances in Publishing and the Media: The News in the Future Program

Jerome S. Rubin

A research consortium has been formed to explore the ways in which news may be disseminated in the future. The program has the somewhat ambiguous name of News in the Future (NiF).

This is a slightly revised version of an address given at the meeting of the Overseers' Committee to Visit the Library, 28 April 1995.

Jerome S. Rubin, who has recently joined Veronis, Suhler & Associates Inc. as managing director, continues to be chairman of the News in the Future program.

The consortium, formed under the auspices of the Media Laboratory of the Massachusetts Institute of Technology, began life in February of 1993. The members of the consortium are twenty-one media and technology companies from eight countries. The research projects are led by seven MIT faculty members, assisted by about twenty graduate students, and I am chairman of the Program.

Before outlining some of the central concepts of the News in the Future research initiative, I would like to provide some background.

In 1967, when this century still had one-third of the way to go, the American Academy

of Arts and Sciences published a report of the Academy's Commission on the Year 2000. The Commission was an all-star team. It included Daniel Bell, Herman Kahn, Pat Moynihan, Erik Erikson, Margaret Mead, David Riesman, Eugene Rostow, and Zbigniew Brzezinski.

Looking back at the Commission's report more than a quarter of a century later, I am struck by its failure to appreciate the astonishing potential of computers and telecommunications. In defense of the Commission, however, I should point out that it was only eleven years earlier, in 1956, that Univac had introduced the first commercially available computer to use transistors instead of vacuum tubes—the so-called second generation. And the first microprocessor was not developed until 1971, four years after the Commission's report.

One member of the Commission on the Year 2000 did come close, but hardly close enough, to perceiving the remarkable changes that electronic technologies would generate. That person was John R. Pierce, who was then head of the Research and Communications Sciences Division of Bell Laboratories and who, incidentally, was the man who coined the word "transistor." After saying that "it will be interesting to see whether CATV will continue to thrive," he said, "If it does, it may help to bring about another long-time dream—the delivery of newspapers to homes by wire."

He then went on to say:

> Although the production of a paper newspaper in the home seems to be clearly impractical, a microfilm newspaper might be acceptable. . . . Experience shows that people want local news and local advertisements in newspapers, as well as national news and national advertisements. In a newspaper distributed by wire, some news and advertisements could be tailored to specific neighborhoods if that proved profitable. Indeed, to some degree, mass communications might be nearly individualized in this process.

Much more recently, our Visiting Committee colleague Michael Crichton has written that today's American newspaper is "another dinosaur, one that may be on the road to extinction . . . gone within ten years. Vanished, without a trace."

Michael says that he resents "the front page editor, or the reporter who prunes the facts in order to be lively and vivid. Increasingly, I want to remove those filters. . . I want direct access to information of interest to me." It turns out that what Michael Crichton wants is an individualized newspaper—a 1990s version of Pierce's vision—for he goes on:

> Once Al Gore gets the fiber optic highways in place, and the information capacity of the country is where it ought to be, I will be able, for example, to view any public meeting of Congress over the Net. And I will have artificial intelligence agents roaming the databases, down-loading stuff I am interested in, and assembling for me a front page, or a nightly news show, that addresses my interests. I'll have the twelve top stories that I want, I'll have short summaries available, and I'll be able to double-click for more detail. How will Peter Jennings . . . or a newspaper compete with that?"

One of the basic premises of the NiF Program is that the distribution of news can indeed be individualized. The idea is to deliver to the individual reader (or viewer or listener) news (and advertising) that meets the particular needs or interests of that individual—and to deliver that news at the time it is needed, at the place it is needed, and in the form that is most useful or convenient to the individual at that time and place.

But in the Media Lab vision of the electronic newspaper, Michael Crichton's double-clicking won't be necessary. In our vision, people will talk to their electronic newspapers (in ordinary English or French or Japanese) and the newspaper/computer will obey those oral commands. If it is more appropriate in some circumstances, we will communicate with our electronic newspapers with simple gestures. Simply put, we propose to eliminate the barriers between the human being and the machine.

In the twenty-eight years since Pierce's comments, computer power has grown so cheap that software can be developed to make computer systems easier and more intuitive to use. An enormous amount of complexity, all of it invisible to the user, can be incorporated at low cost. Systems are becoming increasingly complex on the inside and simpler on the outside. Computer storage has also grown dramatically in capacity and shrunk in cost and size. And both computer power and computer storage continue to get cheaper and to come in smaller and smaller packages.

Similar advances are on the way for computer displays. Flat-panel displays are becoming larger, cheaper and better—offering more brightness, more contrast and higher resolution. Tiny displays with tiny diodes and vibrating mirrors mimic full-size, high-resolution CRTs. And in the not-too-distant future we may be able to use small, bright, thin, flexible displays that approach paper in their congeniality to the human being—perhaps even paper itself in a reusable form, thanks to reversible print.

And the proliferation of digital communication channels will facilitate the delivery of the individualized newspaper. Whether it be through compressed digital TV, 500- or 5-zillion-channel cable systems, satellite distribution, or advances in telephony, bandwidth is becoming a commodity. A single digital TV channel, for example, can deliver the full text of a typical North American daily newspaper in more or less a quarter of a second.

Printing with movable type facilitated the mass communication of news. In the nineteenth century, four centuries after Gutenberg, the steam-driven press, the rotary press, wood-pulp paper, and other technologies of the time made the newspaper even more of a mass-produced, uniform product, carrying the same news and the same advertisements in every copy.

But radio and TV, the leading sources of news for most of the world today, are the quintessential channels of mass communication. While a newspaper reader can navigate through the paper as she wishes—browsing, skimming, and reading at will, radio and TV broadcast the same news to everyone, in the same sequence and with the same amount of time and the same emphasis.

Mass communication is necessarily aimed at majorities or large minorities. It is one-way; it is aimed from the few to the many. But Michael Crichton should not have to thumb through the *Los Angeles Times*, page after page, until he finds some of the stories he wants buried deep inside—if, indeed, the stories are there at all.

With TV and radio, the burden is different: Michael has to wait for *his* stories while all the other news stories, political sound-bites, weather forecasts, and non-Chrichton movie reviews are broadcast, one after the other. And then there are the interviews with unshaven rock stars, illiterate rap stars, semi-literate movie stars, and disgruntled O. J. Simpson jurors—plus, of course, the commercials for products in which Michael has no interest. And the odds are that many of the things he wants to know may not be broadcast at all, because his interests may be idiosyncratic.

Even when the stories that especially interest Michael do turn up buried deep inside the *Los Angeles Times*, or are broadcast on the evening TV news, it is highly likely that he will want to know more than has been presented. As the stores of information accumulate in digital form, it will be increasingly feasible for him to have his individualized stories, and the background and histories of those stories, with as much or as little detail as he may desire.

We are also exploring the automatic creation of user profiles, so that Michael will not have to tell the news system what he especially wants to know. In addition, we are exploring the development of "autonomous intelligent interface agents," software programs that will "learn" from user feedback and user monitoring and will not only personalize news selection but also discover new areas of information in which Michael may come to develop an interest.

In Pierce's peek twenty-seven years ago at the newspaper of the future, he raised as a possible objection to the newspaper electrically delivered to the home the problem of storing rolls of newsprint in people's houses. A valid objection. While the newspaper of the future will not necessarily be presented on paper, paper does have many virtues as an information-display medium. One of the most technologically ambitious projects in the Program is, therefore, examining the possible development of a thin, flexible display with the look and feel of paper—even paper itself with print that can be "reversed" or made to disappear.

Although a computer screen may be superior to paper for reading stock quotes or pinpointed classified ads, paper is clearly preferable for reading most textual material. Reading the *New York Times* in America On-Line, for example, is an awkward, eye-straining experience. I launched LEXIS twenty-two years ago, and lawyers have not yet become accustomed to reading significant bodies of text on the screen. They use LEXIS to find cases and then print them out to read them comfortably. And this is true even of those young lawyers who grew up using computers.

There are also projects in the Program that involve exciting systems for automatic design and layout. These systems provide an extraordinarily rich range of possibilities for the individualized newspaper—whether printed on paper or displayed electronically.

These are just a small sample of the research projects in the NiF Program. But rather than outline the others, it may be more interesting to provide a vision of news in the future that the Program may make possible. So let us look in on a day in the life of a typical suburban couple a few years down the road.

Tillie the Toiler and Harry the Homemaker represent the demographic mean—two children, one dog, and five digital TVs. These digital TVs are really computers that receive and display television signals in digital form. While Tillie is dressing for a day at the office, Harry has fed the kids and sent them off to school. He then relaxes for a few minutes by watching a live broadcast from Tokyo of the third game of the American League playoffs—the Tokyo Giants versus the Toronto Blue Jays. Harry is a great fan of the U.S. national pastime, and the time difference between East Coast U.S. and Japan makes breakfast the optimum time in Chappaqua, New York, to watch night games in Tokyo. Harry has the option of watching the game from just about any point of view he wishes. If he wants statistics on any of the players—lifetime, this season, this series, this game, whatever—he simply asks the computer-television set for them (in plain English) and the set replies immediately, both orally and with text on the screen. The television screen, by the way, is a gigantic flat panel covering an entire wall of the breakfast nook in the kitchen.

Tillie, however, is not a baseball fan. When she arrives in the breakfast nook for the high-fiber, non-fat, low-cholesterol breakfast that Harry has lovingly prepared, she tells the computer-television that she wants to check the world news. The TV then covers its entire screen, which is the entire wall, with a map of the world similar to the one some of you may have seen in the Media Lab's Visual Language Workshop. News headlines appear on the map at the places where the events have happened or are happening. The most recent stories carry the brightest headlines, and the stories that Tillie's autonomous interface agents have selected as being of special interest to Tillie have headlines that stand out in color-coded three-dimensional forms. She tells the computer-television in ordinary English which stories she wishes to see, and the TV obliges. It presents the stories in video or audio or simple newspaper-like text, depending on the nature of the story and the system's knowledge of Tillie's preferences. If Tillie has the time, she asks the machine for background information or more detail on certain stories, and all the while she is looking or listening or asking for more information her trustworthy interface agents are noting what she is focusing on or asking for—so that they can improve their performance in the future.

At one point, the computer-television perceives that Suki, the family's lovable black poodle, is scratching herself with unusual frequency and vigor. The TV immediately brings the situation to Tillie's attention and, with her permission, then presents a captivating two-minute video on life-threatening flea-borne diseases, followed by a series of tasteful advertisements for non-allergenic flea shampoo, biodegradable flea collars, and ultrasonic flea-sex-drive inhibitors that, while not providing immediate relief, ultimately eradicate the host's flea population. If Tillie is tempted by any of the advertised products, she can order them simply by orally communicating her wishes to the TV set.

Since Tillie is a good citizen and sensitive to the concerns of her community, she also is interested in state and local news. She therefore tells the computer-television to replace the world map with one of New York State, then with one of Westchester County or maybe the entire New York Metropolitan area, and finally with one of the Chappaqua-Armonk-Mount Kisco area, focusing on news stories of special interest in the same way she did with the world map. In addition, however, the Chappaqua-Armonk-Mount Kisco screen alerts her to any unusual traffic problems on her normal route to the Chappaqua commuter train station and recommends an alternative route.

After finishing her breakfast and before kissing Harry and Suki goodbye, she retrieves her individualized newspaper, printed on reusable paper, from the kitchen computer-television or one of the family's four other digital TV sets. While the paper contains a good deal of news of general interest, it reflects Tillie's individual interests in what is selected and emphasized and in what is omitted by her agents. As you might expect, they

have filtered out all but the most earth-shaking baseball news. As you also might expect, Harry's agents present him with a very different individualized newspaper. Not only the content, but also the typography, layout, and design of Tillie's paper reflect Tillie's personal taste. In the same way, Harry's paper reflects his personal taste.

Tillie folds the paper, drops it into her briefcase, and reads it on her commuter train. Before she leaves for home that evening, she slips the paper into a digital TV in her office—digitally linked to the computer-television in her home from which it came. All the printing on the paper is "reversed" (wiped off), but Tillie is able to tell the computer-television (in ordinary English, of course) to save certain stories or advertisements in its memory for future reference—and her agents also instruct the computer-television to save certain items. The office TV obliges and produces an evening edition of Tillie's personal newspaper. When she returns home to Harry, Suki, and the kids, she slips the paper back into the home TV from which it came—and she and her agents issue the appropriate instructions to the TV. The next morning, as she sets off on her daily journey to Grand Central Station, she plucks out of the home computer-television that morning's edition of her personalized newspaper.

On some mornings, when Tillie is especially eager to use her evening return-to-home train time to read a fascinating novel, she will take with her an electronic-book reader and a flash-memory card on which the book is stored. Those mornings, she can read her individualized newspaper on the screen of her reader. The screen may be a light-weight, high-resolution flat panel or a thin, flexible plastic screen, or possibly something like today's Private Eye, a tiny device whose clever optics mimic a large, high-resolution screen. The newspaper itself will be downloaded onto a flash-memory card by the same computer-television that on other mornings provides Tillie's reversible-print personal newspaper. She will not only read news stories, but will also look at full-motion video clips if she wishes. If an interesting advertisement catches her eye, she can make it come alive in full-color video. Since speaking to the device would disturb her fellow passengers (and Tillie is not the sort of person to violate commuter etiquette), she will communicate with the device by simple gestures—pointing at a story she wants to know more about, thumbs up for a story she thinks is great, pinkie down for one she thinks is ridiculous, or, to give another example, a flick of the wrist to turn a page.

On her drive to and from the Chappaqua train station, Tillie listens to the playback of a digital storage device that has been recording news filtered from a variety of wire services and radio broadcasts since the last time she listened to it. These filters, which are linked by RF signals to those in the kitchen computer-television, also benefit from instruction from Tillie and the advice of her interface agents. Depending on her mood and what she happens to be working on at her office, Tillie may ask the system to emphasize one or another of her interest profiles. And of course Tillie's agents are especially sensitive to news of traffic and weather conditions on Tillie's route. If Tillie is uncertain of the best way to reach a recommended alternative road, she can ask to have a map displayed on a flat-panel screen in her car's dashboard. The map will highlight the recommended route and indicate Tillie's changing location as she drives along.

And if the tread is beginning to wear on the front tires of her car, the car will alert the system to look for tire ads and bring them to her attention.

Although fleas are unlikely to disappear, baseball and commuter railroads may, so the scenario I have just described may not play out precisely in that form. But however it plays out, it will be alien to today's mass-communication culture. The tale of Tillie the Toiler is not sci-fi fantasy; a number of the pieces are already in place, and others are on the way.

The world map of the opening scene is alive and well in the Media Lab.

We have demonstrated an early version of reusable paper on which we have printed with a standard ink-jet printer.

We can turn pages on a screen, zoom in on a screen, alter audio volume and otherwise control a computer by simple hand gestures without touching the screen and without the use of wires.

We have developed a vision-based recognition system that will bring to life the most dramatic event of the story—the Suki flea-scratching scene.

Although the complexities of human language and the literal-mindedness of the digital computer make dealing with natural language

incredibly difficult, we are building systems that are learning to understand news stories in ordinary English and, believe it or not, in Finnish.

We are developing intelligent agents. Their ability to learn sets them apart from most of the agents being turned loose, or about to be turned loose, in software systems and computer networks today.

We are developing techniques for parsing and filtering audio. We are learning to identify signals in speakers' voices that a new radio news story is to begin—not only pauses but variations in pitch. We have in effect generated "headlines" in radio news, so that the listener can browse audio as well as print. We have demonstrated the ability to listen to more than one story at a time and to emphasize one or another. Because of the audio component in television, this work has broad application there as well as in radio.

We are also making progress on the other technologies implicit in the tale of Tillie the Toiler—technologies necessary to transform the vision into reality. And every day, MIT students receive their personalized electronic newspapers through computer terminals connected to the MIT network. To demonstrate our enthusiasm for paper, these electronic newspapers are known collectively as *Freshman Fishwrap*.

I should like to conclude on a theological note, and I will take the liberty of translating freely from a piece by Umberto Eco:

> Insufficient consideration has been given to the new underground religious war that is changing the modern world. . . .
>
> The fact is that the world is divided between users of the Macintosh computer and users of MS-DOS-compatible computers. I am firmly of the opinion that the Macintosh is Catholic and that DOS is Protestant. Indeed, the Macintosh is counter-reformist and has been influenced by the *ratio studiorum* of the Jesuits. It is cheerful, friendly, conciliatory. It tells the faithful how they must proceed step by step to reach—if not the Kingdom of Heaven—the moment in which their document is printed. It is catechistic: the essence of revelation is dealt with via simple formulae and sumptuous icons. Everyone has a right to salvation.
>
> DOS is Protestant, or even Calvinistic. It allows the interpretation of scripture, demands difficult personal decisions, imposes a subtle hermeneutics upon the user, and takes for granted the idea that not all can reach salvation.
>
> To make the system work you need to interpret the program yourself. A long way from the Baroque community of revellers, the user is closed within the loneliness of his own inner torment.
>
> You may object that, with the passage to Windows, the DOS universe has come to resemble more closely the counter-reformist tolerance of the Macintosh. It's true. Windows represents an Anglican-style schism, grand ceremonies in the cathedral, but there is always the possibilty of a return to DOS to change things in accordance with bizarre decisions. When it comes down to it, you can decide to allow women and gays to be ministers if you want to.
>
> And machine code, which lies beneath both systems. . . . Ah, that has to do with the Old Testament, and is talmudic and cabalistic.

If we pursue Umberto Eco's theological metaphor and extend it to our vision of a system in which the barrier between the human being and the machine is obliterated, we approach the raptures of the Sufi mystics and their medieval European counterparts, like the Scholastic mystic Meister Eckhart. Losing all sense of separation between themselves and the object of their devotion, their souls are united with God in the *unio mystica*. In our vision, however, the union will not be with God but with the computer. Our computer systems will be so powerful that they will be invisible to the user, who will experience the machine as being a part of herself, as much as her own hands, eyes, and voice.