Peter C. Goldmark: Technological Visionary

by

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Introduction

Peter C. Goldmark (1906-1977), developer of the LP record, holder of many patents in color television, father of Electronic Video Recording (EVR), winner of the National Medal of Science, amateur cellist and indefatigable futurist, was a Hungarian-American who was synonymous with the Columbia Broadcasting System's research activities from 1936 until his retirement at the end of 1971. Born in 1906 in Budapest into a family of musicians and inventors, Goldmark soon developed an inclination to tinker and a passion for mechanized visual images. This latter preoccupation led to enchantment with the first, tiny, electronically broadcast pictures, brought to him by John Baird's television kit of 1926. When a Ph.D. in physics from the University of Vienna (1931) did not lead to the opportunity to work on television in Europe, Goldmark left for the U.S. in 1933, intending to work for the Radio Corporation of America (RCA). When the leader in TV research turned him down, he had to scramble until CBS, in 1936, gave him the chance to follow his dreams. In 1954 he became president of CBS Laboratories. After retiring from CBS at the end of 1971, he established his own company, Goldmark Communications Corporation, to pursue far-reaching new visions uninhibited by corporate interests. Unfortunately, his life was cut short in his prime, by a car accident in 1977.

During his career Goldmark was responsible for over 160 inventions that represent every corner of sound recording, telecommunications, and other technologies related to physics and electrical engineering. And throughout his life, he energetically and eloquently sought to apply the technologies he knew—or imagined—to society's problems and potential, especially in the field of education. Beginning in the late 1950s, he promoted closed-circuit television in schools, then video recording and playback as educational tools for the classroom; by the mid-1960s he was beginning to advocate far-reaching technological solutions to core social problems like overcrowded cities and rural poverty. These solutions would become practical only long after his death, in the "information society" or "digital age" of the 1990s: telecommuting, distance education, videoconferencing, mobile phones, and much else made possible by the Internet. Unfortunately, his untimely death leaves many questions unanswered about his contributions to both of his passions: communications technologies and their application to social problems.

The Project

My larger project, under the working title of

Peter C. Goldmark

Inventor and Technological Visionary

The life and times of a learned and flamboyant physicist/engineer

who loved color movies, music, books, and radio waves

and tried to put them together

in technology-based communications products

that would improve people's lives

and make the world more fun and functional,

is aimed at:

1. investigating, evaluating, and putting into context Peter Goldmark's scientific/engineering contributions to these consumer, industrial, and military technologies;
2. exploring Goldmark's social vision as part of the on-going debate about technology as a source of solutions to modern social problems;
3. providing insight into the management and culture of scientific research, technology, and product development in complex organizations like CBS;
4. allowing the story of Peter Goldmark to illuminate several important periods in the history of American technology, business, and industry.

This paper will briefly explore the **second** point, Goldmark's multifaceted projects that sought to apply technology to the seemingly intractable problems of modern urban society. I will focus on the **"New Rural Society,"** a project that took shape in the late 1960s and took off in 1972, when Goldmark had retired from CBS and could devote his full time to it. I'm interested in the following questions:

1. what did this project consist of?
2. How did Goldmark's mind work in this arena?
3. What was distinctive about it? How does he compare to other engineers who want to apply engineering principles or technology to social problems? Where does he fall on the practical – utopian spectrum?
4. What did Peter Goldmark's New Rural Society project actually achieve? That he got considerable government funding shows that someone had confidence in him. If nothing

concrete, then what about the ideas, the promotion of the vision itself? Did that leave any tracks?[1]

Project Background

My interest in Goldmark evolved from a project on a "failed innovation," a video recording device called Electronic Video Recording (EVR), CBS's contribution to the race for educational and home video. I learned that it was the brainchild of Peter Goldmark, a complicated, larger-than-life individual whose many achievements (and failures) were intertwined with the fate of CBS Labs. His color television system, used in such applications as space exploration and surgical education (it brought us the pictures of the moon landing in the summer of 1969), and his LP record were but the most well-known of his inventions, and EVR, "the visual equivalent of the long playing record" was a logical next step.[2]

EVR, as it turned out, was as much a story of technological enthusiasm and brilliant market promotion as of failed innovation. [3] Goldmark's conviction that EVR would bring culture to the hinterlands and serve myriad training and educational purposes was so deep that he did not see (or refused to see) the technology—magnetic video recording—on the horizon that would supercede EVR before it could be debugged. Although CBS's management, when abandoning EVR in 1972, attributed its consequent $30 million write-off to Hungarian bull-headedness, Goldmark's very persistence and the vision behind it had prepared the way for the technologies that did succeed, sooner (the VCR) or later (digital video discs, video streaming, etc.).

In pursuing this story, I could not failed to be captured by Goldmark's imagination and personal charisma. The challenge is, now, to separate Goldmark myth from reality on the basis of evidence (I still find this a worthy challenge).

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[1] A curious bit of evidence as to the New Rural Society project's (or Goldmark's) compelling, if brief influence: In a complication of testimonies (http://www.ampa.de/sugenheim-projekt/stimmen.html, via AltaVista- German language) supporting a technology-based rural development project in Germany called the "Sugenheim-Projekt", a Prof. Dr. George W. Stroke, in a letter dated June 3, 1999, offered his support as a mentor of the program, saying that long ago he had helped the famous Dr. Peter Goldmark with his pioneer efforts for "the Rural Society", which already then had come up with some of the interesting points now proposed in the Sugenheim Project. [". . .noch während meiner Universitätsprofessur- und Vorstandberaterzeit, half ich dem berühmten Dr. Peter Goldmark (ehem. Gründungspräsident der berühmten CBS Laboratories) in seinen Pionierbemuhungen unter dem Stichwort 'The Rural Society', wo einige höchst interessante Aspekte in Ihrem Sugenheim-Projekt schon damals als besonders wünschenswert ins Auge gefasst wurden. . . ."]

[2] For relevant histories of television, see David E. Fisher and Marshall Jon Fisher, "The Color War," *American Heritage of Invention and Technology*, Winter 1997, pp. 8-18; Joseph Udelson, *The Great Television Race: A History of the American Television Industry, 1925-1941* (Univ. of Alabama Press, 1982). For the LP record, see Morton, David, *Off the Record: The Technology and Culture of Sound Recording in America* (Rutgers Univ. Press, 2000), and the forthcoming book by Alex Magoun.

[3] Karen J. Freeze, "A Mostly Abortive Chapter in the Pre-History of the HVE (Home Video Era): Electronic Video Recording, 1960-1973" (a book chapter from which a paper was presented at the Annual Meeting of the Society for the History of Technology, Detroit, Michigan, October 7-10, 1999).

For example, recently several former CBS employees have attempted to debunk the idea that Goldmark was responsible for the LP.[4] Because we like to debunk legends, it's easy to accept that story on face value, but the truth is likely to be found somewhere in between. The people who worked with PCG on another level, including his boss, CBS president Frank Stanton, have said that "of course" Goldmark didn't invent the LP single-handedly. A senior engineer at CBS labs, Renville McMann, says that "Peter didn't claim he invented it. But he was the one with the energy to get it done. Peter knew what he wanted and how to get it – and whom to hire."[5] Goldmark's wife at the time, Frances, is incensed by the revisionism; she claims that the LP was invented—or at least its quality made acceptable—in her living room, where her husband played a passage of Khachaturian repeatedly until it nearly drove her crazy.[6]

A Vision for Urban and Rural Renewal

Beginning in the 1960s, Goldmark became ever more deeply involved in the social problems of his local Connecticut community. For example, he served as chair of The Urban Coalition and the Anti-Poverty Agency in Stamford. He was convinced that overcrowding was responsible for many of the woes plaguing American cities, and that telecommunications technologies could alleviate urban stress by making rural American an attractive, thoroughly practical place to live. EVR was part of this vision; when it failed, he had other solutions in the wings. After all, according to his boss for several decades, president of CBS Frank Stanton, "Peter had more ideas in a day than most others in a lifetime."[7]

Goldmark (and he was not alone) was advocating what today we call the "wired society" and take for granted (notwithstanding our ambivalent feelings about it). But he started articulating these views in the early 1960s, when the technologies necessary to achieve them did not yet exist or were in a primitive, cumbersome state. Even at his death in 1977 at the age of 71, the U.S. was just two years beyond the debut of Sony's Betamax; one year into personal computers (though most people wouldn't be aware of them until the 1980s); and five or so years into the fledgling ARPANET, an informal network of as yet only some 15 universities. Satellite communications were just over a decade old. The first prototype cell phone system was constructed just before his death, and cable TV could potentially offer only 20 channels.

Telecommunications and the City

As chair of the National Academy of Engineering's Panel of Urban Communication from 1968-1972, Goldmark was influential in setting the agenda for the Panel's research. The Panel's

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[4] http://www.kcmetro.cc.mo.us/pennvalley/biology/lewis/crosby/lphist.htm (reprint of Edward Wallenstein article of 1976) and http://www.classicrecs.com/newsletter/newsletter/newsletter.cfm?Article=6 (interview with George Avakian and Howard Scott)

[5] McMann to Freeze, January 21, 2001.

[6] Frances Salant to Freeze, October 24, 2000.

[7] Stanton to Freeze, October 25, 2000.

final recommendations were presented in a 1972 report entitled, "Communications Technology for Urban Improvement." He begins,

> By telephone, radio, leased wire and links with computers one can communicate with someone else almost anywhere in the word; buy, sell, obtain credit and salary; conduct business with a bank; make reservations for transportation and hotel space; send and receive data in numerous forms, and in many other ways link oneself to other parts of the human community without leaving one's home or office. By print, radio, television and satellite one can receive information and entertainment from all parts of the world, often as the even it s happening. With tape and other forms of recording one has access to the memorable sights and sounds of the recent past. [But this is only] a fraction of what could be done to improve the quality of life for everyone if communication systems were more carefully planned and if the full potential of certain technologies were exploited.

The article is a compendium of technical fixes, some of which were realized over the next three decades, others not.[8] Picture, Goldmark suggests in 1972,

> someone who, while driving through a suburban or rural area where he is a stranger, sees a building on fire and wants to report it. He does no know where to find a public telephone or an alarm box. He does not know what fire department to call. If he finds a telephone and resorts to the expedient of dialing 'Operator,' the operator must ascertain where the caller is . . . and the traveler may not know exactly where he is. By the time the right connection is made, the fire may be well advanced.[9]

The technology was available to solve this problem, Goldmark asserted: a two way link between the car radio and a nearby computer, a universal emergency number (such as 911), and automatic locating systems. But his larger purpose was "to suggest a number of ways in which new applications of communication technology could make communication more useful to people as individuals or to entire communities."[10]

The report begins with describing four telecommunications networks. The first is the telephone, whose potential is augmented when it is connected to computers and other systems. The telephone network, Goldmark says, can be considered a pipeline for transmitting data and pictures, as well as voice.

The second is cable television, for which he lists thirteen functions, only some of which have to do with new types of programming–including local, neighborhood programming. These other uses include home shopping, public opinion polling, warning of fire or burglary; timer functions for lights, heat, and other home systems; reading of light, gas, and water meters; premium programming with better color and resolution than standard programming.

The third network is two-way television; and the fourth network represents "the city's sensory nerves," which would provide "information to appropriate centers on . . . weather,

[8] It was reprinted as "Communication and the Community" in the September 1972 issue of *Scientific American*, and included in *Communication*, a *Scientific American* book (1972), pp. 103-108.

[9] Ibid., 103.

[10] Ibid.

pollution, traffic, the location of emergency vehicles, and the status of public transportation."[11] The capabilities of these networks, in Goldmark's mind, were to be applied to five fields in the urban setting: municipal administration, education, health, pollution, and transportation.

The first challenge was to alleviate the citizen's frustration with trying to communicate with the government. The solution: Community information centers, with telephones "manned around the clock by trained operators," who would have at their disposal "a small computer with stored information of the type the operators would be likely to need."[12] (How quaint this seems in 2001!)

Education, Goldmark's favorite cause, received the most attention in the report. The goal of any education program, Goldmark said, should be "to increase the attractiveness and relevance of the curriculum and its availability to the educationally deprived."[13] Television and computers could link up in three ways: interactive instructional television, interactive community information retrieval, and computer-assisted instruction. The stress was on *interactive*. The functions that today's computers and Internet provide, however, Goldmark could offer only through television with some kind of clumsy "teletypewriter" attached to it.

Telecommunications applied to health care was "to extend the services of individuals physicians, both geographically and in terms of the number of patients each one can serve." Satellite clinics could be "linked to one or more physicians by various forms of communication." The clinics would be in neighborhood buildings, schools, prisons, and nursing homes, and the trained staff would connect by telephone or point-to-point television to specialists in the urban centers.

Pollution control was dependent, according to the report, on "the development of systems that can obtain information on the presence and the amount of pollutants. The data could be transmitted to central monitoring stations." Goldmark did not suggest what might then be done to stop the offending polluters.[14]

In transportation, "field telecommunication can be employed much more extensively than it is now to monitor and guide the flow of traffic and to improve the efficiency of mass-transit systems." (Had Goldmark not been a speeding driver himself, he probably would have liked the remote speeding ticket system that such technology has made possible.) My favorite: the New York City public transportation user who would love to have "information at every bus stop about routes, schedules, transfer points, the current passenger load, and the estimated time of arrival of the next bus." There would be "an information box at the bus stop. By means of push buttons the rider could ask for such information as the route followed by each bus serving the stop, and the estimated time of arrival of the next bus going his way."[15]

Another innovation would be a device that located empty parking spaces in large parking lots and displayed them on a screen, so the driver could drive to that spot quickly and efficiently.

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[11] Ibid., 106.

[12] Ibid.

[13] Ibid., 107.

[14] Ibid., 108.

[15] Ibid.

Still another device would "make it possible to prepay the parking fee quickly, by means of a credit card if the driver wished." (These were installed at Logan airport just a few years ago.)

The New Rural Society

Because he apparently considered even the best efforts at improving city life to be insufficient, Goldmark's passion turned increasingly towards the problems of rural life. Already in 1970, as chair of a project at the National Academy of Engineering, he had instigated a multi-year pilot study on the revitalization of rural towns that proposed to "demonstrate that imaginative applications of telecommunications will enable business and government units, separated over wide distances, to function effectively and perhaps even derive additional operational advantages."[16] This "New Rural Society" (NRS) project was being carried out in collaboration with Fairfield University in Fairfield, Connecticut, under generous funding from the federal Departments of Housing and Urban Development (over $700,000) and the Transportation ($150,000) and the National Science Foundation.

Goldmark was convinced that alleviating the overcrowding in the cities was the only answer to the social problems such overcrowding generates, and that "employment, improved health and educational services, cultural and entertainment opportunities and so on could be provided for every part of the country through the imaginative application of telecommunication technology."

In a speech at Yale University in 1972, Goldmark elaborated on the preliminary findings of the New Rural Society project and cited the Club of Rome report, *The Limits To Growth* (by Dennis L. Meadows of M.I.T., et al.) as a vindication of his views: "Dennis Meadows and his colleagues at MIT showed with their computer study . . . that mankind faces a probable collapse within not much more than 100 years if we continue our current life style and industrial output at its current rate."[17]

"I would like to talk about the crisis of our environment," Goldmark continues, "and how communications technology can help to preserve it and even improve it." He elaborates on the deterioration of life in large cities where eighty percent of the population is "virtually trapped" on ten percent of the land. The purpose of the NAE study, already underway three years, had been "to examine how communications technology can change our present pattern of living and successfully alter the grim picture of our future."[18] Goldmark argued that the longer-term solution called for a "total change in our population distribution as well as in our life style – and the key to this plan lies in new applications of existing communications technologies." People need to be able to choose where they want to live, "and this option does not exist today. Thus our plan must induce some 100 million Americans to remain in, or move to attractive rural areas."

Aside from Stalinesque directives, how did Goldmark's committee intend to "induce" people to move from the cities?

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[16] "The New Rural Society." Presentation by Dr. Peter C. Goldmark, President and Director of Research, Goldmark Communications Corporation, Stamford, Connecticut, 1972. Sponsored by Yale University's 1972 Seminars in Modern Journalism, p. 8.

[17] Ibid, 3.

[18] Ibid., 5.

First, he believed they had to be convinced that life would be better in the countryside. The NAE studies revealed, for example, that the incidence of such problems as crime, poverty, pollution, and traffic rose with increased population density. If this is the case, why didn't people migrate away from big cites? Because rural areas lacked (a) suitable employment opportunities; (b) adequate educational and health services; and (c) social, cultural, and recreational pursuits. In each of these areas, the NAE study "found that communications technology can improve conditions considerably."[19]

For example, businesses feared inadequate communications if they settled in remote areas, so the NRS project was researching current office practices in order to understand the kinds of communication they actually needed with the home office. The next step was to be pilot projects that would "simulate actual transmission systems." Because the principal location for the project's research was the Windham Planning Region in northeastern Connecticut, the third phase of the project would involve actual broadband communication between this region and Hartford.[20]

Goldmark's project assumed that healthcare in the Windham region was even more substandard than it turned out to be, having only half the 1:1000 physicians per person enjoyed by the nation as a whole. Thus the project was exploring ways to enhance the performance of paramedical personnel and to connect the local hospital with large medical centers in Hartford. Although such concern seems passé today, when such communications are easy, we have only to look at medical practice in rural outposts and inner cities to wonder if Goldmark didn't have a more general point.

For education the New Rural Society plan was to "link large educational centers with a number of small satellite campuses located in or near the newly expanded towns." Through new two-way cable television systems, "these learning opportunities will be brought to the homes."[21] (Thirty years later we have Internet universities. . .)

As for the third need, attractive cultural and recreational opportunities, NAS proposed "the design and implementation of the ENT-SAT system ("Entertainment Satellite") . . . which would relay live performances from Broadway theatres, operas, concerts, sports events, political religious, educational meetings, to all cities and towns in America using a new high-resolution color television system designed specifically for this purpose."[22] The quality brought by new, high resolution equipment was critical to this success of this vision. (I wonder if we'd be further along in mass use of high definition television if Goldmark had lived?)

Finally, Goldmark told his listeners what the impact of these projects would be on the environment. First, with less consumption of gasoline, there would be less pollution. "People must be encouraged to go on foot, to use bicycles, small automobiles, and small delivery vehicles. Indispensable to such radical changes will be the processes of education in order for every American to realize that what is at stake is the world of our children and grandchildren."[23]

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[19] Ibid., 7.

[20] Ibid., 9.

[21] Ibid., 11.

[22] Ibid., 12-13.

[23] Ibid., 14.

In closing, Goldmark said this about the consumption of energy in the US in 1972, before the "energy crisis" was certifiably underway:

> . . . the generation of sufficient electric energy is bordering on a national crisis. The use of electricity per household has almost doubled during the past 10 years and to a large extent urban life is the culprit. In rural areas, there is less need for air-conditioning and there will be no huge building complexes consuming large amounts of electric power for elevators, light, and other services. . . . NYC's newest skyscraper, the 'World Trade Center', consumes as much electric power as a city of 120,000 people.[24]

Thirty years later, we may wonder at Peter Goldmark's prescience as well as his naivete.

One year later, in 1973, Goldmark's group prepared a preliminary report on the NRS project for HUD.[25] Its introduction echoed Goldmark's previous statements:

> It is the NRS thesis that communication technology can be applied to business and government operations so that components of these could be decentralized to rural areas and operate effectively. The same technology can be applied to education, municipal services, health care and cultural pursuits to improve the quality of life in rural areas so that a living pattern more fully utilizing the nation's land resources could be realized.[26]

Because "a viable option to urban and suburban dwelling does not truly exist today," the NRS research aimed at (a) obtaining "information and experience in applying communications technology to the development of rural areas" and (b) developing "a model of organization and procedure that is transferable to other rural areas."[27]

The objective of the NRS research was to see whether the *vision* Goldmark had for the *potential* of these technologies actually would make sense in practice. For example, if one believes that technology can enhance business communications to the point where companies could/would be willing to move to rural America, then one needs to understand a) how businesses actually operate; and b) test new ways to enhance those operations. The HUD funds helped support that kind of research.

The researchers were looking at three "tasks" in the Windham Planning Region: (1) the Regional Community Development Task; (2) the Institutional Communications Task – Business and Government; and (3) the Experimental Communications Task.

The preliminary findings under the first "task" catalogued conditions in the Region. The researchers found that the primary health care delivery system, while actually having a ratio of physicians to the population of two-thirds the national average, was nonetheless overburdened. The NRS project had already inspired physicians in the area to "seek methods for improving this

[24] Ibid.

[25] Peter Goldmark, et al., *The 1972/73 New Rural Society project: Report to the Department of Housing and Urban Development*. Fairfield, Connecticut: Fairfield University, 1973.

[26] Ibid., iv.

[27] Ibid.

situation," proposing that "health care assistants and communications technologies be applied systematically to optimize the utilization of the regions' hospital and physician resources."[28]

Second, Windham actually had "an abundance of telecommunications resources as compared to other educational systems in other rural areas," but that it did not yet coordinate the use of existing facilities an manpower resources optimally.[29]

Third, one fourth of the commuter population, "a substantial reservoir of skilled labor which could be drawn upon by business and government moving to the area," would prefer employment in the region.[30]

The NRS also announced the Community Communications Center (CCC) for the region that was in an early planning stage. Its key idea was that shared central communications resources could result in lower cost to users. Moreover, the CCC could have satellite ground stations for receiving transmissions by the entertainment satellite system (ENT/SAT). Live theatre and concert performances could be broadcast to a nationwide chain of CCCs.[31]

Under the Institutional Communications Task, the NRS considered employment opportunities in the region. Most businesses did not move from city to country because they perceived a "lack of communications facilities at the proposed site and [were concerned] over potential loss of personal contacts." To understand just what was meant by this, the NRS project was engaged in an "

> office communications analysis. The intent has been to characterize the communications of an organizations, including meetings, correspondence, and telephone contacts. These data, in combination with an understanding of how electronic systems could handle some of these communications, permit identification of the organization's components which could be most easily decentralized.[32]

The "Experimental Communications Task" was examining the "effectiveness of telecommunications systems for carrying out aspects of business and government office communications, and for providing health and educational services and cultural and entertainment activities."[33] Because employment was critical, their emphasis was on office communications and, specifically, teleconferencing. Because video links were still primitive, the project focused on audio-only systems, and had gone so far as to develop an "isophonic multi-source system," in which "the stereo effect is relatively insensitive to the position of the listener." [34] They had engaged in a two-day field trial using microwave links between Hartford and Willimantic, in the Windham region, and demonstrated how various audio and video

[28] Ibid., v.

[29] Ibid., vi.

[30] Ibid.

[31] Ibid.

[32] Ibid., viii.

[33] Ibid.

[34] Ibid., ix.

conferencing techniques could be substitutes for transportation. Goldmark routinely stressed, however, that the NRS did not want to deny the importance of face-to-fact communications.[35]

As a result of these studies, the report indicates, the Windham Regional Planning Agency had added communications technology to their planning activities. The report concluded with an outline of the research to be continued over the next year. [36]

The Transportation Connection

Three years later, in 1976, the NRS submitted a report to the Department of Transportation on the socioeconomic impact of investment in transportation and communication.[37] This part of the research was carried out in Pitt County, North Carolina, and Indiana County, Pennsylvania. The DOT was interested in role telecommunications might play as a complement or substitute for transportation of goods and people. Its "basic hypothesis was that investment in or improvements of transportation and communication would enhance rural socioeconomic development."[38] In a Foreword to this report, Goldmark stated that "more and more, our nation's most critical domestic issues involve the closely interrelated urban, rural, and energy problems."[39] He slightly tweeked the NRS's objective, adding "voluntary" to the vision:

> The New Rural Society project has as its objective the application of communications technology towards upgrading life in rural communities in order to encourage a voluntary decentralization of people, business, and government. This is based upon the belief that the current highly concentrated population distribution in the United States is far from being an optimal match to the most efficient use of the nation's human, environmental, and earth resources.[40]

The study used a multi-industry, multi-regional forecasting model to look at the effects of investment in both transportation and communications technologies.

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[35] "The New Rural Society" (Yale talk), p. 15.

[36] The archives of the project are held at Fairfield University; I expect to see them during the next academic year.

[37] "Socioeconomic Impact of Investment in Transportation and Communication. A Methodology Utilizing a Multi-Industry Multi-Regional Forecasting Model Modified to Incorporate Investment in Communications." Final Report, No. DOT-TST-76T-7, August 1976, prepared for U.S. Department of Transportation, Office of R&D Policy, Washington, D.C. 20590. Foreword by Peter C. Goldmark, Project Director. [At this time I have access only to the Foreword, Preface, and Executive Summary. The full report is at Fairfield University.]

[38] Ibid., iv.

[39] Ibid., i.

[40] Ibid.

Very Preliminary conclusions

a. Peter Goldmark was an engineer with the classic engineer's passion to fix things. He continually saw connections between disparate things, and wished to bring them together into solutions–technical or social. According to his family, he was always fixing things, but he was also very playful, with a sense of humor. He had a track record of work with urban institutions like the Anti-poverty league and Urban Coalition in Stamford, CT, which perhaps helped get significant federal funding for NRS research. He insisted that "the technology was already available" for his proposals – yet, as it turned out, much of what he envisioned was made practical only twenty years later, by different technologies that he imagined.

b. Goldmark was ultimately pragmatic, rather than utopian. Perhaps because of his work in with public institutions in Stamford, he doesn't seem to have been an ivory tower scientist with directives to remake life according to a formula. He did not favor the idea of "new cities," but rather wanted to see old towns in rural areas revived, made attractive places for people to live and work. Although he was opinionated, certainly, and by force of personality was used to driving things through, he recognized the importance of *voluntary* experimentation with the New Rural Society. In fact, later in his life, he mellowed, claiming that all our inventions weren't leading to happiness.

c. Yet the NRS project essentially dies when he does. According to some of the colleagues who worked on the NRS project, it simply petered out when its visionary leader was gone. I am hoping that the extensive archives of the project, held at Fairfield University and at the National Academy of Engineering, will enlighten me as to what was actually accomplished by the project.

Epilogue

Since becoming captivated by the Goldmark story two decades ago, I have watched many of its protagonist's visions became realities and cannot resist speculating on what he might have thought of them in 2001. Everything EVR was supposed to offer (including the *Encyclopedia Britannica*) is now the domain of the CD ROM and DVD; would Goldmark have been delighted by the elegance of these solutions? Did he anticipate them?

Moreover, the Internet has certainly destroyed the primacy of location; people can indeed work anywhere and be in contact with each other across any distance. But what does the latest U.S. Census show about the distribution of the US population in 2000? Indeed, communications technologies (and air conditioning!) can be credited for the development of both the urban and rural South, but elsewhere, "urban flight" cannot be always attributed to a positive choice toward healthier living. Nor has it usually resulted in the thriving rural communities Goldmark envisioned. Although some great cities like Detroit have been abandoned, others have experienced remarkable renewal; it would be interesting to determine the role played by telecommunications technologies in their revival.

In the early 1970s was Goldmark privy to the fledgling ARPANET, the infant guise of the Web, and did he have an inkling of the problems that would arise as that very technology

developed? (Would he have been satisfied with the quality and utility of the "wired society" of 2001, or would he, like TV inventor Vladimir Zworykin, claim that his favorite part of the technology was the "off" button?) When Goldmark proposed a consumer "radio phone" for emergencies, could he have imagined the ubiquitous cell phone? Would he have been among the first to own one, or would he have been outraged the first time a cell phone rang during a concert?

In 1949 Goldmark pioneered the use of color television in surgical education—did he foresee the endoscopic surgery that is routine today? When he developed "Highway Hi Fi," a short-lived record player for Chrysler automobiles that used a 7-inch disk at 16 2/3 rpm, did he imagine that one day the tapedecks and CD players would be practically standard equipment in our cars? (Certainly he would have been delighted with that development!.)

Perhaps in the course of my research I'll be able to answer some of these questions!

