***In Memory of Robert Herman (1914-1997)***

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I first encountered Robert Herman as the co-author with Elliott Montroll of a pair of insightful and delightful papers, “A Manner of Characterizing the Development of Countries”[[1]](#endnote-1) and “Some Statistical Observations from a 75 Year Run of Sears Roebuck Catalogues.”[[2]](#endnote-2) At the time, I was a young researcher wondering how to make estimates of greenhouse gas emissions from industrial processes extending out to the year 2100, and even more puzzled about how to think, with quantitative precision, about how farming, travel, and other technical systems might operate in a changing environment.

Already in the late 1970s, chaos was popular. And discouraging. After all, I was seeking long-term regularities, stable evolutionary tracks, and predictability. But in the work of Bob and Elliott and their collaborators, whose articles I eagerly obtained, a quite different outlook prevailed. First, their eyes were imaginatively open to all sorts of observations, whether the time history of the price of a dozen eggs or the behavior of cars and drivers on Detroit roads. And second, their models actually worked. The result was a cheerful body of work, confident that all kinds of systems would yield up their secrets to the mentally prepared.

Coincidentally, Montroll then chaired the Commission on Socio-Technical Systems of the National Research Council, where I was employed. I contacted Montroll and we met a few times, enough to inspire me to try to work in his way. Montroll, perhaps already aware of his failing health, also urged me to contact Bob. I knew Bob’s face from the National Academy of Engineering (NAE) member’s directory. Bob was smiling and looked a little like Groucho Marx. Quite unlike the other 1000 pictures!

Approached by phone, Bob immediately welcomed the new prospective explorer. Our subject was cities. Bob suggested I come down to Austin and join in the festivities and seminar for his upcoming 70th birthday. It was a great chance to see the fruits of his humor and curiosity, and before I flew back to Washington DC, we had agreed to try to explain infrastructure, past, present, and future.

In fact, this 1984 meeting marked the start of a dozen years of intense interaction. With support from the NAE and its president Robert White, we organized a Woods Hole workshop on “Cities and Their Vital Systems,” highlighted by Bob’s singing Russian children’s songs while we searched for a local fisherman to bring us back across the Sound from Martha’s Vineyard where a group of us had gone for dinner and missed the last scheduled ferry, crazily appropriate for experts contemplating all the world’s infrastructure. In a scene recalling the Humphrey Bogart film, *To Have and Have Not*, Captain Lester Baptiste sailed us across in his small open boat, with the August moon luminescing the plankton in our wake. The workshop led to a book that Bob and I co-edited containing a remarkable, enduring paper by Bob, Siamak Ardekani, Shekhar Govind, and Edgar Dona on “The Dynamic Characterization of Cities.”[[3]](#endnote-3) The book, by the way, helped inspire “SimCity,” an entertaining and instructional video game that has now sold over 2.5 million units, and remains recommended reading in the latest edition, “SimCity 2000.”

Typically, Bob expanded his interests into the field of environment, and in particular the question of the metabolism of cities, to use a phrase of his long-time friend Abel Wolman, the great Hopkins-based civil engineer. Bob asked the very basic questions, what is going in and what is going out of cities and how is it changing? This led us to write a paper entitled “Dematerialization” (with Siamak) that appeared in the 1989 volume on *Technology and Environment*.[[4]](#endnote-4) We found out how the weight of cars had changed, of course, but we also delved into the number of pairs of shoes consumed and the qualities and quantities of all sorts of objects of material society.

“Dematerialization” has now become a byword of environmental studies, so widely used and obvious that its source is rarely cited. Bob joined with Iddo Wernick, Shekhar, and me in a sequel on “Materialization and Dematerialization: Measures and Trends” that appeared in the summer 1996 issue of *Daedalus*.[[5]](#endnote-5) Ever hungry for data, Bob managed to extract 50 years of records about the floor and plot area of dwellings from the Realtors of Austin. (Floor area per person doubled.) And from the Household Goods Carriers Bureau we learned how the average weight of household moves had changed. (The average load increased from ’77 to ’91 by 20% to over 3000 kg!) We never did manage to learn how much an average building weighs and how that weight is changing, but we will.

Bob was always deeply interested in universities, and another collaboration focused on understanding the university as a complex system. Supported by the Alfred P. Sloan Foundation, Bob led a seminar in the spring of 1996 on this subject at UT-Austin, stimulated a Georgia Tech workshop about it, and joined with Bill Massy (Stanford) and me in starting to build an interactive simulation game about a fictional university, now called “Cybercampus” [later [Virtual U](http://www.gamespot.com/features/virtual-u-2694634/)]. Our article “Simulating the Academy: Toward Understanding Colleges and Universities as Dynamic Systems” appeared in a book published a couple of weeks after Bob’s passing.[[6]](#endnote-6) The development of CyberCampus is proceeding well; the product should be in the marketplace within the next two years. We hope it will create a science of universities as Bob created a science of traffic.

I must mention two other threads in Bob’s life, his fine visual sense and New York City. Bob was shy about his achievement as a sculptor, but quality will out. His elegant, finely polished, asymmetric creations in beautiful woods have now been displayed several times, including in the building of the National Academy of Sciences in Washington DC. On Bob’s visits to New York City, where he had grown and gone to college, Bob was always keen to return to the Metropolitan Museum (to the musical instruments, and arms & armor) and the Morgan Library (for illuminated manuscripts) and to the Houk Friedman photographic gallery on Madison Avenue which Bob had helped establish, and where he retained a superb print of the classic late portrait of Einstein among several fine pieces. In the last few years, led by Italian physicist Cesare Marchetti, who had also been aboard Captain Baptiste’s boat on Vineyard Sound, we delved deeply into Leonardo da Vinci, making discoveries of micro and crypto images in Leonardo’s works that will be reported in coming years.

Bob’s visits back to New York were always a great pleasure. Bob took sincere, keen interest in the students and young scientists in my group at The Rockefeller University, especially Iddo Wernick and Perrin Meyer. Together, we prepared an analytic tribute of Bob’s career for his 80th birthday, charting his pulses of creativity in different fields as S-curves or logistic wavelets. Bob had a gentle but utterly convincing way of conveying the excitement of science and the high standards needed to make it worthwhile. The same effect came from sitting in on his chats with Frederick Seitz, President Emeritus of RU, reminiscing about physics in Princeton in the 1930s. Yet, off we would go, chuckling, to the New York City Transit Museum to inspect the vintage 1920s subway cars in which Bob had ridden from the Bronx to City College. The conversation never stopped, just as Bob’s phone calls could go on, with an infinity of leads to pursue.

 I am deeply saddened by Bob’s passing, but ever lucky to have known and worked with him. And amazed that our friendship and collaboration, so productive and fresh, began when Bob began his 70s.

1. Robert Herman and Elliott Montroll, “[A Manner of Characterizing the Development of Countries](http://www.pnas.org/content/69/10/3019.full.pdf),” *Proceedings of the National Academy of Sciences USA 69(10)*:3019-3023, 1972. [↑](#endnote-ref-1)
2. Robert Herman and Elliott Montroll, “Some Statistical Observations from a 75 Year Run of Sears Roebuck Catalogues,” in U. Landman, ed., *Statistical Mechanics and Statistical Methods in Theory and Application*, Plenum, New York, 1977, pp. 785-803. [↑](#endnote-ref-2)
3. See R. Herman and J. H. Ausubel, “[Cities and Infrastructure: Synthesis and Perspectives](http://phe.rockefeller.edu/cities/cities.pdf),” pp. 1-22, and R. Herman, S. A. Ardekani, S. Govind, and E. Dona, “The Dynamic Characterization of Cities,” pp. 22-70 in J.H. Ausubel and R. Herman, eds*.,* [*Cities and Their Vital Systems: Infrastructure Past, Present, and Future*](http://www.nap.edu/openbook.php?isbn=0309037867), National Academy, Washington DC, 1988. [↑](#endnote-ref-3)
4. R. Herman, S.A. Ardekani, and J.H. Ausubel, “[Dematerialization](http://phe.rockefeller.edu/docs/Demat.Tech.Forecasting.pdf),” in J.H. Ausubel and H.E.Sladovich, eds., [*Technology and Environment*](http://www.nap.edu/openbook.php?record_id=1407), National Academy Press, Washington DC, 1989, pp. 50-69; also published in *Technological Forecasting and Social Change 38(4)*:333-348, 1990. See also J.H. Ausubel, R.A. Frosch, and R. Herman, “[Technology and Environment: An Overview](http://phe.rockefeller.edu/docs/Tech.Env.pdf),” in J.H. Ausubel and H.E.Sladovich, eds., *Technology and Environment*, National Academy Press, Washington DC, 1989, pp. 1-22 [↑](#endnote-ref-4)
5. I.K.Wernick, R. Herman, S. Govind, and J.H. Ausubel, “[Materialization and Dematerialization: Measures and Trends](http://phe.rockefeller.edu/Daedalus/Demat/),” *Daedalus 125(3)*: 171-198, 1996; also published in J. H. Ausubel and H. D. Langford, eds., [*Technological Trajectories and the Human Environment*](http://www.nap.edu/openbook.php?isbn=0309051339), National Academy, Washington DC, 1997, pp. 135-156. [↑](#endnote-ref-5)
6. J. H. Ausubel, R. Herman, W.F. Massy, and S. Massy “[Simulating the Academy: Toward Understanding Colleges and Universities as Dynamic Systems](http://phe.rockefeller.edu/CyberCampus/index.html),” in J.W. Meyerson and W.F. Massy, eds., *New Models for Higher Education*, Peterson’s, Princeton, 1997, pp. 107-120. [↑](#endnote-ref-6)