

8. I. Hoch, in paper presented at the conference on Public Policy and the Quality of Life in Urban Areas.
 9. U.S. Bureau of Labor Statistics, *Area Wage Surveys*, individual metropolitan areas, annual, 1966, 1969, and 1970.
 10. Calculated on the basis of regression equations fitted to cost-of-living data in U.S. Bureau of Labor Statistics, *Autumn 1971 Urban Family Budgets* (News Release USDL-72-240, 1972).
 11. I. Hoch with J. Drake, *J. Environ. Econ. Manage.* 1, 268 (1974).
 12. Calculated on the basis of regression equations fitted to per capita income data in *Surv. Curr. Bus.* 49 (May 1969); *ibid.* 51 (May 1971); *ibid.* 54 (May 1974).
 13. Calculated on the basis of data in U.S. Bureau of Economic Analysis, Regional Information System, "Migration matrix," 18 January 1973.
 14. U.S. Bureau of the Census, *Congressional District Data Book, 93rd Congress* (U.S. Government Printing Office, Washington, D.C., 1973); *Congressional District Data, 94th Congress* (U.S. Government Printing Office, Washington, D.C., 1974), for California, New York, and Texas. Sample size: 434. Data are based on information in 1970 *Census of Population*.
 15. To obtain the percentage change in income per order of magnitude of population, divide the coefficient for log "metro" population in Table 2 by average income \$3081.561.
 16. Regression equations that relate indexes of per capita income and all federal taxes to SMSA population and to the South show that the tax index increases faster with population than does the income index. The U.S. average value = 100 for each index; data is for fiscal year 1972 (17).
- | Independent variable | Income index | Federal tax index |
|----------------------|--------------|-------------------|
| Coefficients | | |
| Constant | 50.75 | 32.05 |
| Log population | 18.90 | 25.04 |
| South | -8.53 | -9.66 |
| t ratios | | |
| Constant | 7.48 | 3.28 |
| Log population | 8.09 | 7.45 |
| South | 4.81 | 3.79 |
| \bar{R}^2 's | | |
| Explained variance | 0.48 | 0.41 |
17. Calculations were made on the basis of data in *Federal Tax Burdens in States and Metropolitan Areas* (Tax Foundation, Inc., New York, 1974), tables 13 and 15, pp. 18-30, 32-34. Per capita income figure for the United States was set at \$4325, on the basis of data in *Surv. Curr. Bus.* 53, 25 (May 1973); *ibid.* 54, 6 (May 1974).
 18. I. Hoch, in *Population, Resources and the Environment*, R. Ridker, Ed. (Commission on Population Growth and the American Future, 1972), Research Reports, vol. 3; in *Transport and the Urban Environment*, J. G. Rothenberg and I. G. Heggie, Eds. (Macmillan, London, 1974).
 19. I. Hoch, *J. Urban Econ.* 1, 184 (1974).
 20. Similar results for population size and density were obtained for the probability of urban riots in the 1960's [R. F. McNown and L. D. Singell, *Ann. Regional Sci.* 8, 1 (1974)].
 21. E. T. Fujii [*J. Urban Econ.* 2, 181 (1975)] states that "addict crime has risen to the point that in major urban centers police attribute half or more of all property crime to addicts." See also D. J. Mulvihill and M. M. Tumin, *Crimes of Violence*, (Staff Report, National Commission on Causes and Prevention of Violence, U.S. Government Printing Office, Washington, D.C., 1969), vol. 2; R. L. DuPont and M. H. Green, *Science* 181, 716 (1973); G. F. Brown, Jr., and L. P. Silverman, *J. Am. Stat. Assoc.* 69, 595 (1974); L. G. Hunt, *Am. J. Public Health Suppl.* 64, 16 (1974); Executive Office of the President, *Special Action Office Monograph* 5 (19 October 1974).
 22. A review of positions taken on the question of a magic number for city size appears in P. Goodman [in *Urban America: Goals and Problems*, Joint Economic Committee, 90th Congress, 1st session (1967)]. A. Downs notes that there is considerable agreement among urban experts favoring a metropolitan area size of about 250,000 to 300,000, adding that this is "not a scientific conclusion but a strictly sentimental opinion" [testimony before Commission on Population Growth and the American Future, (13 July 1971), p. 9]; A. Spilhaus [*Science* 159, 710 (1968); *Daedalus* 96, 1129 (Fall 1967)] advocates an optimum city size of around 250,000.
 23. I. Hoch, in *Urban Problems and Public Policy Choices*, J. Bergsman and H. L. Wiener, Eds., (Praeger, New York 1975).
 24. For discussion of primate cities, see *International Encyclopedia of the Social Sciences* (Macmillan, New York, 1968), vol. 12, pp. 373-374. Montevideo is an example of the class; see E. Griffin [*Geogr. Rev.* 63, 500 (1973)]. C. A. Vapnarsky [*Econ. Dev. Cultural Change* 17, 584 (1969)] discusses primacy versus the "rank-size rule."
 25. M. Friedman, *Price Theory* (Aldine, Chicago, 1962), p. 210.
 26. The Alan Guttmacher Institute, *Family Plann. Perspect.* 7, 224 (1975).
 27. A. R. Pred [*The Spatial Dynamics of U.S. Urban-Industrial Growth, 1800-1914* (MIT Press, Cambridge, Mass., 1966)] argues that innovation and invention are positively related to both city size and growth rate. The diffusion by size argument appears in W. R. Thompson [in *Issues in Urban Economics*, H. S. Perloff and L. Wingo, Eds. (Johns Hopkins Univ. Press for Resources for the Future, Baltimore, 1968)].
 28. *Mon. Labor Rev.* 98, 101 (1975).
 29. G. V. Fuguitt and C. L. Beale, *Population Change in Nonmetropolitan Cities and Towns* (Agricultural Economics Report 323, U.S. Department of Agriculture, Washington, D.C., 1976).
 30. In 1969, average public assistance income in New York City relative to the average of 97 SMSA's was 1.88, while relative income per capita was 1.25; (8). In 1972, M. Friedman argued that "because so large a part of the voting population already consists of city employees and welfare recipients," New York City would not cure its "city disease," which he identified as local government spending [*Newsweek* 79, 96 (20 March 1972)].
 31. For a 5-week period in late 1972 and early 1973, the percentage of next day delivery of mail was as follows: national, 80 percent; South, 89 percent; New York City, 69 percent [P. Kihss, *New York Times*, 18 February 1973, p. 1].
 32. The poverty level is defined by the Social Security Administration poverty thresholds adjusted for changes in price levels; the poverty level for farm families is set at 85 percent of that for non-farm families. H. Kahne, *J. Econ. Lit.* 13, 1271 (1975).
 33. D. P. Moynihan, *The Politics of a Guaranteed Income* (Random House, New York, 1973), pp. 352-356; review of Moynihan [P. Passell and L. Ross, *New York Times Book Review Section*, 14 January 1973, p. 16].
 34. J. L. Sundquist, *Dispersing Population* (Brookings Institution, Washington, D.C., 1975).
 35. G. M. Neutze, *Economic Policy and the Size of Cities* (Australian National Univ. Press, Canberra, 1965); J. Spengler, *Natl. Resources J.* 7, 367 (1967); J. M. Buchanan, *Am. J. Agric. Econ.* 51, 1033 (1969); G. S. Tolley, *J. Urban Econ.* 1, 324 (1974); G. S. Tolley and J. Gardner, paper presented at AAAS meeting, Boston, 18 to 24 February 1976.
 36. My argument disregards distributional questions that can affect political feasibility of proper pricing. (i) The interests of current residents may not coincide with the interests of the people who would reside in the city if the change were implemented. (ii) The relatively poor might bear more costs and obtain fewer benefits than the relatively rich. Initially, this could limit population growth or even reduce it, even though the city increased its spending for labor. But ultimately, multiplier effects of the increased spending would probably increase population. Both factors may explain why effluent charges and urban toll roads have had limited application in practice.
 37. E. S. Mills and F. M. Peterson present the case for the market in the context of urban sprawl [*Am. Econ. Rev.* 65, 267 (1975)].
 38. See the seminal works of T. W. Schultz on investment in human capital.
 39. U.S. Department of Commerce, *Surv. Curr. Bus.* 51 (May 1971).
 40. Source of data: U.S. Bureau of the Census, *Current Population Reports, Series P-25, No. 618* (January 1976).
 41. I thank J. Drake, who served as research assistant.

NEWS AND COMMENT

Kronid Lyubarsky: The Soviet State Tries to Unmake a Scientist

While one Viking analyzes the surface soil of Mars and another circles the planet in search of a landing site, a man who more than most would love to follow the spacecrafts' progress is unable to do so.

He is Kronid Lyubarsky, an astrophysicist and astrobiologist who has made a special study of Mars and contributed to the Soviet attempts to explore the planet.

3 SEPTEMBER 1976

Lyubarsky is in prison, where he is serving a 5-year sentence for having helped distribute the journal of the Russian civil rights movement and other self-published literature. His case is of particular interest because of the tenacity with which he has tried to continue his scientific work while in prison, and because of the state's efforts to deny him the right to call himself a scientist.

The state's latest move is an expedient that even Orwell never thought of, a proposal to revoke Lyubarsky's scientific degree. It is not known whether VAK, the Highest Certifying Commission, has acted on the proposal, which came before it a year ago, but at least three other scientists are reported to have had their degrees revoked. "VAK, apparently, does not understand," Lyubarsky noted in a statement which was written from prison on 1 October last year and has just now become available, "that a scientist can indeed be demoted from the ranks of his peers, but it is not within its power to do so, fortunately."

Lyubarsky's trial, held from 26 to 30 October 1972, took place behind closed doors after those who wished to attend had been evicted from the courthouse.

But according to the December 1972 issue of the *Chronicle of Current Events*, Lyubarsky made the following statement to the court in explaining why it was natural for the scientific worker to strive to find things out for himself:

... For me and the people of my generations this idea ... was all the simpler, all the more natural, in that we had been reared in a special era, in an era when cybernetics was a pseudo-science, when genetics was declared to have fascist tendencies, when probability theory was an idealistic vagary. That was the era when "the essence of all philosophy" was contained in chapter four of the *Short History of the All-Union Communist Party (Bolsheviks)*, when all economic theory was covered in Stalin's *Economic Problems of Socialism* and nowhere else—God forbid! And so, that kind of upbringing bore its fruits. So I will never take anyone at his word. Not later, and not now.

The sentence was 5 years in strict regime camps, even though his health was precarious. He has had three-quarters of his small intestine removed and suffers from spasms of blood vessels in the brain which induce fainting. Even so, he was granted no special diet privileges.

In a letter to *Science* (5 April 1974), Valery Chalidze, a fellow member of the civil rights movement who is now in exile in New York, reported that, "Despite the difficult conditions of his confinement, and despite serious illness, Lyubarsky has maintained his interest in scientific developments related to Mars: it will be most unfortunate if his punishment for freethinking, together with other consequences, involves the partial loss of his scientific qualifications because of lack of an opportunity to follow scientific literature."

Chalidze asked readers of *Science* to send articles and copies of the Mariner photos of Mars to Lyubarsky's prison camp. Presumably little of this material reached him, because in October of the same year Lyubarsky wrote in a letter to the World Federation of Scientists of the problem faced by the many political prisoners who are scientists by profession.

"Each of us," Lyubarsky said, "whatever his political convictions, remains a scientist as before, and tries to preserve his professional skills under any conditions. But the conditions under which we are kept in the camps are so arranged as to prevent that to a maximum degree." Soviet publications are impossible to obtain if more than a few years old, and all foreign publications are forbidden. Letters from scientific colleagues require many months to censor and often are not delivered at all. Under such conditions, Lyubarsky notes, "We are faced with total creative impotence. We are not



Kronid Lyubarsky

merely being deprived of freedom temporarily: we are being deprived for ever of a cherished thing—our profession."

The loss of a scientist's skills, he adds, "is further accelerated by purely physiological factors. We are all compelled to do heavy physical work of a kind for which many of us, no longer young, are hardly fit. This leaves us neither the time nor strength for intellectual activity."

The letter concludes: "I ask you—and in your persons, scientists everywhere—to intervene in this very distressing situation out of feelings of humanity and professional solidarity. . . ."

Lyubarsky's appeal has been heeded by his colleagues in the United States, but without much effect. Thirty specialists in meteors and meteorites (another of Lyubarsky's interests) sent a petition on his behalf to Soviet Premier Alexei N. Kosygin but met with no response. In December last year, 191 astronomers signed a petition to President Podgorny requesting that because of Lyubarsky's poor health, the remainder of his prison sentence and subsequent period of exile be remitted as an act of clemency.

The appeal for clemency has had no known effect. In October 1974, after several protests and hunger strikes, Lyubarsky was transferred from the Moldavian labor camp to which he had been sentenced, to the Vladimir prison, where especially hard conditions are enforced. If he survives his prison term, he will be released next January.

In his most recent statement, about the move to revoke his degree, Lyubarsky says that a group of his former fellow workers were put under strong

pressure to ask that VAK deprive him of his degree of candidate in physical-mathematical sciences.

The motive, he states,

was my allegedly "antipatriotic" activity, by which one means my political dissidence and open expression of convictions. . . .

Attempts to treat scientists according to their political views, and not their scientific achievements, have been made many times in many countries. In each case it was done during the darkest periods in the history of these countries. VAK should remember this fact. The most deplorable aspect in all this is that . . . again people are compelled to vote, each being ashamed of himself and the others, for what they know in their souls to be unfair and disgraceful. . . .

Turning to the question of whose activity is unpatriotic, one should remember that the last word here remains with history. I am in jail now. Well, the grateful memory of history keeps the names of many prisoners. But I seek and cannot find the name of a single jailor. The members of VAK should reflect on this fact before adding to the numbers of the latter.

Lyubarsky has written numerous articles on meteors, plants and space biology, and is the author of the books, *Essays on Astrobiology*, *Cosmic Biology and Medicine*, and *The Planets of the Earth Group—Mars*. He has translated several works into Russian, including Fred Hoyle's *Galaxies*. Born in 1934, he worked until his arrest at the Chornogolovka Institute of Solid State Physics near Moscow.

Lyubarsky may not now be in a position to contribute directly to the advance of knowledge, but his efforts on behalf of free inquiry and expression contribute to the same end. Equally remarkable is the nature of the state that makes such efforts necessary.—NICHOLAS WADE

U.S.S.R. Exchange Rejected

The chairmen of six departments at the University of Maryland have decided not to accept any more Soviet-initiated requests for the placement of scientists in their departments, although they will continue to accept scientists of their own choice. The move is a protest against Soviet policy on scientific exchange, which often prevents scientists chosen by their American colleagues from accepting the invitation. The University of Maryland, for example, has not been allowed to receive Benjamin Levich, a distinguished electrochemist. The six professors note that they and others have been similarly frustrated when inviting other Soviet scientists to conferences.—N.W.