

# Letters

Pasadena, California

EDITOR:

On the inside cover of the April issue you have a US Steel advertisement on the Seattle Space Needle.

The exciting thing about this project which would make the advertisement more valuable to US Steel and of greater interest to your readers is that the consulting engineer on the job was none other than Caltech's own John K. Minasian '38, MS '44.

RICHARD C. GERKE '47

Honolulu, Hawaii

EDITOR:

"The Cold War" by R. L. Minckler in the March issue of *Engineering and Science* is just what we need around here to counteract some of the defeatist literature and ideas that get into the heads of the East-West students at the University of Hawaii. If you have a few extra copies of this issue we would like to plant them among the students.

CARL W. CARLMARK, MS '41

Dabney House, Caltech

EDITOR:

After reading "The Cold War," I feel certain clarifications should be made concerning the following paragraphs which compare Russian and United States economic growth:

"... I think it is reasonable to expect that our economy can grow at a 4 percent annual rate. On our 1962 base of \$560 billion, that is an increase for the first year of \$22.4 billion. The present seven-year-plan of the Russians calls for a 7 percent increase in national income. That, on their present base of \$210 billion, is an increase for the first year of \$14.7 billion. If we increase our production \$22.4 billion in one year and the Russians increase their production only \$14.7 billion in one year, how are they ever going to catch up with us, even if our rate of growth is 4 percent and theirs is 7 percent? It is a fact that, on a per capita basis, the Russian economy would have to grow at a rate of three times ours for 20 years to catch up with us."

If the Russians were able to maintain their 7 percent growth rate and we our 4 percent rate, by a property of compound interest their GNP

(gross national product or national income) would eventually become larger than ours, irrespective of how large ours was to begin with. The mechanism is as follows: In the first year of growth the Russians have added to their GNP seven percent of their GNP, yielding a new GNP. In the following year seven percent of this new GNP is added to this new GNP to give the GNP at the end of the second year. If  $A_0$  is the starting value of the US GNP,  $R_0$  the starting value of the USSR GNP,  $A_n$  the value of the US GNP at the end of the nth year of growth,  $R_n$  the value of the USSR GNP at the end of the nth year of growth,  $r$  the rate of growth of the Russian GNP,  $a$  the rate of growth of the US GNP, and  $n$  the number of years of growth, we may generalize and write the following formulas:

$$R_1 = R_0(1+.07); R_2 = R_1(1+.07) = R_0(1+.07)^2 \text{ etc.}$$

In general:

$$R_n = R_0(1+r)^n \text{ \& } A_n = A_0(1+a)^n$$

where  $r$  and  $a$  must be constant for these formulas to be accurate. Using  $A_0 = \$560$  billion,  $R_0 = \$210$  billion  $r = 7\%$  (.07) and  $a = 4\%$  (.04), let us compute some GNPs for different  $n$  (years).

$A_0 = \$560$ billions	$R_0 = \$210$ billions
$A_1 = 582.4$	$R_1 = 224.7$
$A_{10} = 829.00$	$R_{10} = 414.00$
$A_{20} = 1230.00$	$R_{20} = 811.00$
$A_{35} = 2210.00$	$R_{35} = 2250.00$

As can be seen from the chart, the Russians would pass us in the 34th year if the growth rates were as stated above for these years. The important question is, can the Russians maintain a higher growth rate than ours?

Mr. Minckler states that the USSR would have to grow at a rate of three times ours for 20 years to catch up. Using our formulas above, we can see that he means three times some specific percent, for the statement is ambiguous otherwise. For instance, a ratio of rates does not uniquely determine  $n$  since one obtains one equation in two unknowns! (He may have meant the Russian rate of 7% to be three times ours, for 2 1/3% & 7% yield 20 years above.)

Life again turns out to be not so

simple when comparisons of the relative economic position of two countries are attempted. Difficulty is encountered when a common base for comparison is sought (dollars, rubles, etc.). This is the same difficulty encountered when comparisons over time are attempted (1937 prices, 1944 prices, etc.). The problem is clearly compounded when two countries are compared over time. The problem is simply that, in general, each different base yields a different answer. (This is called the index number problem.)

Keeping in mind the effects of compound interest and the indexing problem, we may still conclude that the Russians have a rugged task to catch up to us.

JOHN GOLDEN '62

## A reply from R. L. Minckler:

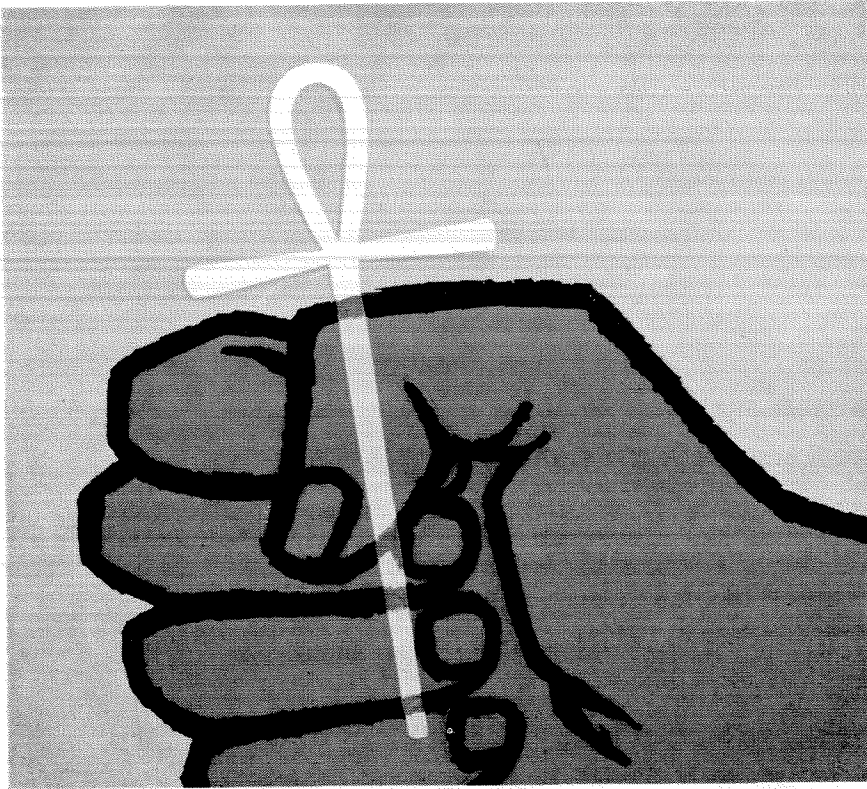
"Mr. Golden's arithmetic is correct, but his interpretation of what I meant to say is not. The same point he makes was picked up by a reader of the Pasadena *Star-News*, in which my article was reprinted, so the safe conclusion can be made that my language was sloppy.

"What I meant to say was that, so long as our absolute growth in GNP in any one year is greater than that of the Russians, they will never catch up to us, regardless of what the rates of growth are. I thought I had made it quite clear at several points in the article that I put little faith in 'rates of growth' as being indicative of future prospects. I referred to them as a 'phony numbers game.' I mentioned the 11.2% increase in Russian automobile production from 1959 to 1960, but then gave the very small actual number of automobiles involved.

"In this matter of comparative economic growth of Russia and the United States, a major study has just been published by the National Bureau of Economic Research (*The Growth of Industrial Production in the Soviet Union: Princeton University Press*). This book by G. Warren Nutter, University of Virginia economist, deals with industrial output, not gross national product, and comes to the same conclusion I did, that the

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## Letters . . . *continued*

Russians are not going to catch up with us.

"Nutter finds that the value of Russian industrial production was about 14% of our level in 1913, dipped to 9% in 1928, and rose to 20% in 1955. Our production in 1913 was \$25-30 billion higher than Russia's, in 1928 it was \$50-55 billion higher, and in 1955 it was \$115 billion higher. There is no evidence of Russia's catching up in these numbers.

"Nutter also points out the difficulty of maintaining high rates of growth as the base of industrial production increases. He comes up with the following historical rates of growth for Russia's Communist industrial production, leaving out the period of revolution and chaos 1918-1928, when there was probably no increase, and the World War II period, when the increase was very small:

1928-37	12.0% per year
1950-55	9.6%
1955-59	7.0%
1959-61 (Plan — not actual)	5.5%

"I do not believe that it is possible for Russia and the United States to realize 7% and 4% rates of growth in GNP for the indefinite future. At these rates arithmetic would equalize the two countries' GNP in about 35 years at a level four times our present one. To accomplish this size of a gain for us would require the development of something as important as the automobile (cars, highways, oil, rubber, service stations, garages, parking, motels, suburbia and the other things that go with the automobile) and I see no new thing that big. I am not even sure that such a growth would be good for us.

"Russia could move into the automobile age, as we have, but that would require a change in Russian objectives from world domination to service to the Russian people. It would require a change in their system. I should hope that that is what will happen, and my article was intended to indicate that pressures now being created by successes in the United States and Western Europe (I could have added Canada and Japan and a few spots in Latin America and Asia) and by failures in the Communist world could very well bring that about sooner than we think."