T O M K A I S E R : *Some Disagreements.*

It is a pity if we allow a natural distaste for some features of American official reaction to Russian Sputniks to cloud our judgment of the role and importance of science and technology in modern society. The decision to press for the launching of artificial earth satellites for geophysical studies was made by international agreement between scientists concerned with the International Geophysical Year. The governments of the U.S.A. and the U.S.S.R. agreed to attempt such a project, to co-operate in observations of the satellites whoever should be first successful, and to make freely available the results obtained. The fact that both countries were making the attempt presumably stimulated a not unhealthy sense of rivalry and competition between the groups of scientists concerned (although the Americans tended not to regard the Russian proposals as serious even immediately before the launching of Sputnik I.). But this is quite a different thing to the almost hysterical manner in which the Russian success was greeted in some quarters of die West and especially in the U.S.A. One wonders whether, if the Americans had been first, the Soviet leaders would have reacted in a like manner - I doubt it. We should certainly not be blind to the fact that the successful launching of a satellite for peaceful scientific purposes may, in view of the state of U.S. opinion, lead to a development of the military missile race to a highly dangerous extent.

When all has been said about the peaceful intrinsic nature of the sputniks, we must be realistic and see that they are a by-product of the armaments race, and in the words of the popular song ' that's the way the money goes.' But while we campaign! against the vast arms expenditure and point to the endless possibilities raised by diversion of the labour and materials involved to peaceful pursuits. it is nevertheless unreasonable to deny the application of technique developed in military research to non-military purposes. This is not to say that the cost of launching a satellite is trivial but simply that it is small compared with the total arms budget. Neither can we ignore the one sided development of science to which excessive concentration of military research inevitably leads, and clearly the solution to this problem is only likely to be found in large scale disarmament.

Few people will have remained unimpressed by the level of technology represented by the satellite launchings, raising both hopes and fears concerning the outcome for civilisation. The potential, if not the actual, level of civilisation of any society must rest to some extent on the leisure available to man, after satisfaction of his basic needs, in which he can engage in creative activities. In this respect the criterion of *per capita* power production, which certainly is related to the standard of living of a community, may have its relevance as a measure of civilisation. The extent to which it may be so raises wider social issues. One sees that together with expanding production of power, steel and the other basic essentials of modern industry and agriculture, goes increasing inefficiency and waste in their utilization. Socialists will argue that this is inevitable only in a capitalist society, that within a planned, socialist economy we can hope to avoid it, and certainly the facts increasingly support this view. To take an example: if we took steel production as our measure of economic and industrial potential, then we would reach, in my opinion, quite wrong conclusions concerning the U.S.A. and the U.S.S.R. Although the former country has the world's highest *per capita* production, when we take account of the unbelievable waste in utilization (e.g. in the U.S. automobile industry) the lower figure for the U.S.S.R. does not represent a correspondingly low economic level. Indeed when future generations come to assess the damage done they will not single out the sputniks but will indict capitalism for the senseless squandering of natural resources. Of course the development of consumer goods industries in the U.S.S.R. still considerably lags that in the West but it is now apparent that there is, if anything, some productive capacity available in heavy industry, surplus above domestic requirements, enabling the U.S.S.R. to offer assistance in the industrialisation of underdeveloped countries. Here again there is a parallel in the U.S.A. where, however, the result of heavy industry running at some 80 per cent capacity is a crisis of under-investment, and a developing slump which, if it is maintained, may be averted by a further considerable expansion in armaments. The alternative, which is to follow the policy of the U.S.S.R. in offering long term low interest loans for industrial development abroad, is politically unacceptable because state control and ownership is the only political and economic basis for such development acceptable to the countries emerging from colonialism.

Finally a word concerning future developments in power production. While expansion of convential as well as nuclear power stations

must continue for a considerable period it is inevitable that, even in countries richer in natural fuels than Britain, an increasing proportion of future development will be nuclear. Coal is too valuable chemically to use as a fuel if alternative means are available, and already nuclear power stations are proving as economic as coal fired ones, even in a coal producing country. With adequate controls and safety precautions the danger of the Windscale type of accident should be negligible. (The tragedy of Windscale is not least in the extent to which it may have undermined public confidence in nuclear power). A difficulty may eventually arise in the disposal of radioactive effluents - certainly international agreement will be necessary on this point. It is true that any increase in the natural background of radioactivity is potentially harmful, nevertheless, and in contrast to contamination due to nuclear bomb tests, this can be balanced against the positive benefits available from nuclear power. A more urgent problem may arise from the possibility of accumulation of fissionable material produced in a nuclear power station and its illicit diversion to atomic weapons. Unless the present atomic powers jointly seek to prevent the development of nuclear power outside their borders (this would seem both unreasonable and unenforceable) the only solution is in an easing of tension allied with an acceptable system of control and inspection by an international agency.

It would be imprudent to do more than speculate concerning the thermonuclear generation of power from fusion (as opposed to fission) reactors. Zeta has proved that sufficiently high temperatures can be produced for short periods in the laboratory, but the remaining scientific and technological problems are, to say the least, formidable. Some newspaper reports on this subject (typified by headlines such as " Britain Tames the H-Bomb !") are misleading. Whereas the present nuclear power stations may logically be regarded as in direct succession to the military atomic programme, the H-Bomb and the controlled thermonuclear reaction represent essentially two divergent developments. It is therefore fair to say that without the H-Bomb programme, employing as it does a large body of highly skilled scientists and technologists, the prospects of thermonuclear power might be considerably brighter.