

quite different than fundamental research. (It appears that within the last few years, some drug industry spokesmen are becoming more willing to admit that the share of their research budget devoted to truly basic research is a minor one; but there is no sign of any retreat from the position that the type of research which they do engage in is of immense benefit.)

It is not surprising that drug firms devote relatively little time to strictly fundamental research since this sort of activity is inherently risky in that the firm incurring the costs may not be in a position to capture all the benefits. Basic research, in the sense of activities which extend the frontier of knowledge, is potentially the most productive form of research, but also the riskiest. Risky to whom? Here in a narrow sense the answer is clear—to the firm which invests in this activity, since failure to obtain results will mean the loss of investment. But to whom is basic research productive? It depends upon the ultimate implications of what you find, which are quite unpredictable. It may help the firm doing the research, but it may help its competitors even more. Or it may help firms in different industries. Or it may simply accrue to the benefit of humanity generally.

To engage in basic research, a drug firm must satisfy itself that this use of the company's funds is more productive than an alternative use in applied research, marketing, or the like. Such a decision is contingent upon obtaining satisfactory answers to the following questions:¹⁰

(1) What is the risk of failure of a given project? (Fundamental research is always highly risky; this is its very nature.)

(2) If the project is successful, will the findings ever be commercially applicable? (Many findings are too generalized to be immediately applicable, although they may lead to subsidiary findings which will have commercial applications.)

(3) Will the resulting findings ever lead to patentable discoveries? (Often the findings are not patentable in the form in which they are obtained, and unless they can be embodied in some sort of marketable item, may never be profitable even though patentable.)

(4) Will the time horizon between initiating the research project and its fruition in the sales of commercially marketable products be sufficiently short that the discounted rate of return on the investment will justify the outlay? (If initial risk is high and the research and development period is long, the net return over time may be lower than can be earned through such alternative uses of the funds as marketing, even though the project is eventually successful.)

(5) Will the "gestation period" of product development for patentable discoveries be short enough that patent protection will be commercially profitable?

(6) Will the discoveries prove to be of equal or greater benefit to the rivals of the firm? (With the well-developed state of the art of molecular manipulation, this is a great risk and may discourage basic research to some extent.)

(7) Will the discoveries prove to be of greater application in industries outside the pharmaceuticals field? (This is a distinct possibility since pharmaceuticals is a very specialized field. It might be more likely that a major firm in the chemical industry could undertake basic research that might lead to either a chemical or pharmaceutical discovery, and in the latter event it might be possible to diversify into drugs. The reverse is less likely.)

(8) Will the discoveries pose the threat of obsolescence to presently profitable products?

These constitute a large number of difficult hurdles to clear, and so it is not surprising that drug firms should do little truly basic research. Actually, fundamental research is ultimately a philanthropic activity in the sense that it always has some potential for benefiting society generally. Hence it is appropriate that most basic research be carried out by endowed foundations and universities as well as publicly financed agencies specialized for this purpose.

It may be concluded that under efficiently competitive conditions, private drug firms would not do much basic research because greater profits would be more likely if the money were invested in other functions. Instead, the industry would rely upon the results of basic research made publicly available by more broadly-

¹⁰ See Submission of the Government of the Province of Alberta, *op. cit.*, p. 2435.