

GOOD WORK

E. F. Schumacher

PREFACE

When E. F. Schumacher died in September 1977, his friend Barbara Ward described him as belonging to that intensely creative minority who have changed the direction of human thought. And his two books *Small is Beautiful* and *A Guide for the Perplexed* would alone ensure that his ideas will remain very much alive.

Fritz Schumacher's ideas were the product of a highly original and creative mind; they are generally radical, demanding drastic alterations in conventional ways of thinking and doing; and they have a universal quality about them, which appeals to countless people of different ages, classes, races, and shades of political and religious belief. But I think that there is an even more uncommon quality about his ideas, which is that they lend themselves to, indeed invite, action.

The most obvious example is his concept of intermediate technology. The critical role of technology in economic development was first brought into perspective by Schumacher in a report prepared in 1962 for the government of India. Three years later, a few of us helped him to start the intermediate Technology Development Group in London to implement the idea, to develop and make known technologies appropriate to the needs and resources of poor people in poor communities: tools and equipment deliberately designed to be relatively small, simple, capital-saving, and environmentally nonviolent. Today, there are more than twenty similar groups operating in as many countries, and the concept has been taken up by UN agencies, governments, and voluntary organizations throughout the world. It is now recognized as being every bit as relevant to the rich countries as to the poor.

Looking back on more than twenty years of work and friendship with Fritz Schumacher, I am struck by the consistency with which his work has changed the course of events. When he was in his thirties, while working as

a farm laborer in England, he drew up a plan for a new international monetary payments clearing system, which was immediately adopted by Lord Keynes as the official U.K. government proposal on the subject. A few years later he was the principal author of the famous Beveridge report on full employment. In the 1950s and 60s as economic advisor to the British coal industry he became a persistent--and in official eyes often highly unpopular--one-man early warning system on the dangers of overdependence on oil, and the even greater dangers of nuclear power. During this time he became president of the Soil Association, a director of the Scott Bader Commonwealth, the pioneer common-ownership company in Britain, and chairman of the Intermediate Technology Group.

Once the Group was started, Schumacher continued his analysis of the impact of conventional technology and its supporting structures upon people, upon living nature, and upon nonrenewable resources. In *Small Is Beautiful* he launched a powerful attack on conventional economics and technology, and the value system supporting both. But he did not stop there; he also mapped out a sane route toward a sustainable way of life. This was followed up by *Guide for the Perplexed*, which offers the individual a philosophical framework, a guide to the moral values that underpin *Small Is Beautiful*.

The present book, *Good Work*, is compiled mainly from a series of lectures he gave in the United States during the mid-1970s, a tour during which some sixty thousand people heard him speak, and which culminated in a meeting at the White House with President Carter. Three chapters are based on earlier written essays; they have been included for their relevance to the subject of good work.

In many respects the very starting point of *Good Work* is a reflection, or rather an extension, of both earlier books. At the heart of our system of work lies our system of values, and more precisely, our view of the individual and his relationships with others. By way of illustration, consider one of the current pseudo-intellectual clichés, that work is part of the Protestant ethic and that a more enlightened view of it is (presumably) that the less work you can get away with, the better. This is a cynical and degraded view of human nature (certainly not subscribed to by any religion that I know of) because it assumes that money is the sole reason for working. Set this view against Schumacher's opening remarks in this book, in which he identifies three purposes of human work: to produce necessary and useful goods and

services; to enable us to use and perfect our gifts and skills; and to serve, and collaborate with, other people, so as to "liberate ourselves from our inborn egocentricity."

You do not have to prefer this interpretation of work, and of what people and life are about, to enjoy this book; but you will enjoy the book all the more if you do, because *Good Work* is an exploration of the political, managerial, social, and economic consequences of conventional technology (and therefore of conventional values), and of alternatives that are already becoming visible: alternatives that in one way or another support the three purposes of human work identified by Schumacher. Throughout the book he draws freely on his personal experience of involvement in such alternatives, whether of management, ownership, or technology: his work in the National Coal Board, with the Intermediate Technology Development Group, with Scott Bader, with the Soil Association, and in India, Zambia, and other developing countries.

Taken as a whole *Good Work* rounds off and makes explicit Schumacher's case that the choice of technology is one of the most critical choices now confronting any country, rich or poor. The poor countries must secure technologies appropriate to their needs and resources-- Intermediate technologies--if the rural masses are to be given a chance to work themselves out of poverty; but the rich countries probably stand even more in need of a new technology, smaller, capital- saving, less rapacious in its demands on raw materials, and environmentally nonviolent. The people of poor and rural countries must be helped to raise themselves to a decent standard of living. We ourselves must also work for a more modest, nonviolent, sustainable life-style. That is surely the way toward greater equality between and within nations.

The sixty thousand people who heard Schumacher give these talks will, I am sure, be glad that the editing has been kept to a minimum; the temptation to reduce the lectures to formal essays has been resisted. The fortunate result is that here we have Fritz Schumacher at his best, on his feet, often thinking aloud, bringing his personality and creative energy, as well as his remarkable mind, to bear on what is certainly one of the most critical tasks that now confronts rich and poor societies alike: how to enable us to do creative and satisfying work, earn a decent living, live in a becoming way; and having done so, as George Kennan once put it, to leave the planet earth in a

condition at least no less capable of supporting life than that in which we found it.

GEORGE MCROBIE

PROLOGUE

A recent article in the London Times began with these words: "Dante, when composing his visions of hell, might well have included the mindless, repetitive boredom of working on a factory assembly line. It destroys initiative and rots Drains, yet millions of British workers are committed to it for most of their lives." The remarkable thing is that this statement, like countless similar ones made before it, aroused no interest: there were no hot denials or anguished agreements; no reactions at all. The strong and terrible words--"visions of hell," "destroys initiative and rots brains," and so on--attracted no reprimand that they were misstatements or over-statements, that they were irresponsible or hysterical exaggerations or subversive propaganda; no, people read them, sighed and nodded, I suppose, and moved on. Not even the ecologists, conservationists, and doom watchers are interested in this matter. If someone had asserted that certain man-made arrangements destroyed the initiative and rotted the brains of millions of birds or seals or wild animals in the game reserve of Africa, such an assertion would have been either refuted or accepted as a serious challenge. If someone had asserted that not the minds and brains of millions of workers were being rotted but their bodies, again there would have been considerable interest. After all, there are safety regulations, inspectors, claims for damages, and so forth. No management is unaware of its duty to avoid accidents or physical conditions which impair workers' health. But workers' brains, minds, and souls are a different matter.

A recent semiofficial report, submitted by the British government to the Stockholm Conference, bears the title "Natural Resources: Sinews for Survival." The most important of all resources are obviously the initiative, imagination, and brainpower of man himself. We all know this and are ready to devote very substantial funds to what we call education. So, if the problem is "survival," one might fairly expect to find some discussion relating to the preservation and, if possible, the development of the most

precious of all natural resources, human brains. However, such expectations are not fulfilled. "Sinews for Survival" deals with all the material factors--minerals, energy, water, etc.-but not at all with such immaterial resources as initiative, imagination, and brainpower.

Considering the centrality of work in human life, one might have expected that every textbook on economics, sociology, politics, and related subjects would present a theory of work as one of the indispensable foundation stones for all further expositions. After all, it is work which occupies most of the energies of the human race, and what people actually do is normally more important, for understanding them, than what they say, or what they spend their money on, or what they own, or how they vote. A person's work is undoubtedly one of the most decisive formative influences on his character and personality. However, the truth of the matter is that we look in vain for any presentations of theories of work in these textbooks. The question of what the work does to the worker is hardly ever asked, not to mention the question of whether the real task might not be to adapt the work to the needs of the worker rather than to demand that the worker adapt himself to the needs of the work--which means, of course, primarily to the needs of the machine.

Let us ask then: How does work relate to the end and purpose of man's being? It has been recognized in all authentic teachings of mankind that every human being born into this world has to work not merely to keep himself alive but to strive toward perfection. To keep himself alive, he needs various goods and services, which will not be forthcoming without human labor. To perfect himself, he needs purposeful activity in accordance with the injunction: "Whichever gift each of you have received, use it in service to one another, like good stewards dispensing the grace of God in its varied forms." From this, we may derive the three purposes of human work as follows:

First, to provide necessary and useful goods and services.

Second, to enable every one of us to use and thereby perfect our gifts like good stewards.

Third, to do so in service to, and in cooperation with, others, so as to liberate ourselves from our inborn egocentricity.

This threefold function makes work so central to human life that it is truly impossible to conceive of life at the human level without work. "Without work, all life goes rotten," said Albert Camus, "but when work is soulless, life stifles and dies."

1. The End of an Era

You can go on and on blowing air into a balloon. The balloon then becomes bigger and bigger, and more and more impressive.

Historians can record with pride and satisfaction the dates when the first efficient pump was invented, and then ever more efficient pumps, and marvelous new chemicals which increased the stretch ability of the balloon, and when the balloon reached a certain size, and then twice that size, and how "doubling times" became shorter and shorter and so on.

All these will be important and interesting dates. But none so important and interesting as the date when a hole appeared in the skin of the balloon--perhaps, to start with, quite a small hole--and the air started whistling out.

That date was October 6, 1973.

Things will never be the same again.

I was sitting on a train the other day in England and found myself in a compartment with three gentlemen who were having a heated debate. I couldn't help hearing what they were saying and I gathered that one of them was a surgeon, one was an architect, and the third was an economist. They were discussing whose was the oldest profession. After a totally inconclusive debate finally the surgeon said, "Look here, come off it? I mean, there's no doubt: if you know Genesis, the Lord took a rib out of Adam to make Eve, and that was a surgical operation."

But, unabashed, the architect said, "Well, long before He did this He had created the whole universe out of chaos: that was an architectural job."

And the economist said merely, "And who created chaos?"

The subject must be seen in this light, particularly now that we have passed the 6th of October, 1973, a date unique in the history of the Western world, a sort of watershed. You will recall that the 6th of October, 1973, was the day when the fourth Arab-Israeli War started. Let's go back into the history, not of this particular war, which merely triggered a situation, but to the history of the situation itself.

As far as my own observations go, after the Second World War there was a general scarcity of fuels, particularly in Europe: everybody was shouting for more coal. And in the middle 1950s the OECD, that organization of the wealthy countries, set up an energy commission which issued a report, Europe's Energy Requirements: Can They Be Met? The report said, For goodness' sake, be careful; pull out all stops to work for fuel efficiency; don't neglect Europe's one major energy source, the coal industry. (It also said a few things in ignorance about nuclear energy, as if that might be a savior.) This report was accepted universally as being realistic and truthful. In Britain we set up the National Industrial Fuel Efficiency Service to go through industry and see where fuel could be saved.

And then came the first Suez crisis, about the Suez Canal, and a shock went through all the oil-importing countries, including the United States, the biggest oil producer but also by far the biggest oil consumer. At that time the President of the United States was a former general, General Eisenhower; and he said, What is this? Are we dependent on oil from the Middle East? How so? Well, it was quite easy. America had been extremely richly endowed with oil, but had been exploiting this for a hundred years, and it was now necessary to go deeper and deeper to find the oil. Whereas the Middle East was a relatively new bunch of oil fields, where virtually every bore hole had oil in it. So Middle Eastern oil was very much cheaper than U.S. oil, and more and more Middle Eastern oil was flowing into the United States. And also the oil companies had geared themselves up for this flow.

But Eisenhower looked at it and said, I'm not having it. I'm spending so many billions on armaments, none of which can function without oil, and we're making ourselves dependent on Middle Eastern oil, right next door to the Soviet Union, and the Russian bear with one move of its paw can wipe it out, and what then? So he imposed an import control. If I may say so, the United States is always for free trade except when it doesn't suit her. In this case it didn't suit America to have free trade, so she put on an import control providing, roughly speaking, that 88 percent of American oil requirements

would be met from indigenous sources, only 12 percent imported, and that 12 percent primarily from the Western Hemisphere, which means North and South America. The oil companies, having geared themselves for an ever-increasing flow of oil into the world's biggest market, the United States, found that the shutters had come down. They diverted this oil into Europe, the second-biggest market, and there ensued a murderous competition against coal to make room for the oil, and also internecine, murderous competition between the oil companies to obtain ever-increasing market shares. A part of commercial thinking is not that you're interested in the quantity you sell but in the share of the market. And this murderous competition, against both coal and against each other, induced them to lower prices, and for long periods they were selling at a loss to Europe, just to conquer the market. And of course once the coal mines are shut, you can't reopen them--not deep mines.

One of the sufferers in this was the oil-importing countries, since the price of oil was pressed down and down. And when the companies put the price of oil down again, vis-à-vis the oil-exporting countries, these countries said, We've had enough; we must get together and fight this in self-defense, That was in 1960, when they set up OPEC. Everybody said, Oh, these are Arabs and others, they can't agree with one another, so it's just an attempt to form a cartel and nothing will come of it. Well, of course, for a number of years nothing did come of it, because these things have to find their feet, and that takes some time. But they assembled a few knowledgeable people around them--they had all the money in the world to do so--and by the middle 1960s they understood the business.

Previously the oil-exporting countries had nothing to do with their business because it was run by the oil companies, which had immense resources and could assemble a great deal of talent. But now OPEC was assembling this talent, and by around 1965 the oil-exporting countries realized what was happening: that oil is actually not produced by man, it is found by men. It's a sort of larder, and you break into the larder and fetch it out: and when you fetch it out it's no longer there. It's different from producing wheat, where you can produce one crop one year and the next year another crop. And, provided your farming methods are not utterly atrocious, you can go on and on and on doing it; it's not a diminishing asset. But oil, like coal, is extracted: it is a diminishing asset. The oil-producing countries realized this, and, listening to the projections of requirements made by the European countries, by Japan, and by the United States, they said,

Good Lord, this is a sellout? We have another twenty or thirty years, and what then? They started making noises. But some understood it better than others. At that time, the person who was most greedy to increase oil output was the Shah of Iran: he couldn't think beyond the end of his nose. He said, If I produce more oil, I get more money.

Well, the others were getting more and more worried about their resources, and then at the end of 1969 something happened. In Libya there was a change of government; Colonel Gaddafi chucked out the old king and became head of state at the ripe old age of twenty- eight. He inquired, How long will this oil bonanza last? The answer he got back. Well, we can only go by proved reserves; how much more might be found heaven knows; that's pure speculation. But if you want to know how long these reserves that we actually know exist will last, at the established rate of expansion they'll last for eight years. And if you stabilize the rate of output, then they'll last for twenty years.

Well then, no doubt Colonel Qaddafi, aged twenty- eight, said twenty-eight plus twentyand what then? Back to sand and camels..... I'm not having it. I want to have at least sixty years ahead of me.

He went to the companies and asked them not to increase but to throttle output, only marginally. He was very ill received, and when he found he couldn't really get along with the companies, he nationalized them so that he would have control. The immediate effect of one country marginally reducing crude-oil output in 1970 was a 50 percent increase in the world's level of crude-oil prices.

A lesson was learned that would never be unlearned again: namely, that with oil, the less you produce the richer you become. Because oil is a non-reproducible, nonrenewable asset of limited duration, and the demand is virtually inelastic--there was just as much motoring after the petrol prices had gone up 20 percent as there had been before, and motoring is only the tip of the iceberg of oil consumption. But Colonel Gaddafi had become the world's most hated man, and the other Arabs and oil producers didn't want to get into his position. They felt, 'The oil-importing countries are a dangerous lot, not unused to violence, and we are nothing. They didn't know what to do. They were getting more and more deeply worried about their reserve position, and the fact that, taking all the oil-exporting countries together, on certain assumptions their life expectancy for the oil was seventeen years, on

more favorable assumptions twenty to twenty-five years: which makes no difference. I mean, those are just minutes in the life of a nation.

What can you do? You don't want to imitate Colonel Gaddafi and just forge ahead; you want to tread softly. They sent around the General Secretary of OPEC, and he went to all the oil-importing countries making speeches, saying, Now, please, for goodness' sake, mitigate your requirements. This is a big sellout; and what is to become of us? You may be dreaming about Project Independence or about nuclear energy bailing you out or finding more oil in Alaska or the North Sea or under the North Pole. But in order to get this oil and build the pipelines you will be taking all our oil. Of course you're paying for it; but what's the use of it? If you are bleeding to death and you get paid for- it that doesn't postpone death. What is to become of us? That's the question. Every speech ended. There are 250,000,000 people: what is to become of them? Their only livelihood is oil; and in twenty-five years we cannot build up an alternative livelihood. So please, please mitigate your requirements.

Of course, nobody listened. Then came the 6th of October, 1973, when, to the consternation of Washington, D.C., the greatest friend of the United States, King Faisal himself, that reliable, honorable gentleman, said, We are now going to use oil as a political weapon against Israel. As long as this war goes on, we shall reduce oil output by 5 percent--or was it 10 percent? - every month. Panic in the oil-importing countries. At the international oil auctions, the price gets bid up more and more and more; within a few weeks it's up to four times its previous level--and that's after the 50 percent increase of 1970. And, when it had reached that level, the oil-exporting countries said, Now, for the first time, we see what our product is really worth, what the importers are willing to pay for it. Let's make that the official price; and now, of course, oil as a political weapon? Forget it. You can have as much as you like, at this price.

Toward the end of the 1960s, the United States made some forecasts about her oil-import requirements, because, although she is still the biggest oil producer, oil outputs leveled off in 1970-71; they have reached their limit and are reckoned to come down. Yet oil consumption is reckoned to go on rising, and so there is a widening gap. About five years ago it was announced from Washington that in 1985 the United States would wish to buy from the Middle East and North Africa as much oil as those territories had ever produced. Needless to say, that gave a little shock both to Japan

and to Western Europe. If America buys all the oil, oh no, no, no, the Arabs will have to double the oil output, and particularly Saudi Arabia, the great friend.

So King Faisal sends his oil minister, Mr. Yamani, to the United States just to say, Well, yes, we can expand our oil output--they weren't thinking much about oil reserves--but how are you going to pay for it' And he was told, Well, you can recycle your funds and buy up American industry. But you may remember a few years ago Time magazine had an article about 1985, about the Arabian princes arriving in Detroit as the main shareholders of General Motors, and in other places the main shareholders of IBM and Columbia Broadcasting System: a futuristic picture, which at the time seemed to enchant Mr. Yamani. But when Yamani went back to his King and said, It's wonderful? we're going to become the greatest liberated capitalists there ever were; we shall be owning large parts of American industry. Old King Faisal said, Forget it. We Arabs know how easy it is to expropriate the accursed foreign capitalist; one stroke of the pen by Congress and we're expropriated. And what then? We've lost the oil, and what can we do, send a gunboat over to the United States? No, no ... the only safe investment for the oil is to leave it in the ground unless you need the cash from producing and selling it.

So we already know that they were not prepared to take long-term investments, After all, they have experienced how easy it is to expropriate even powerful and they are powerless in any other terms except oil. So, the 6th of October, 1973, triggered this, and my own forecast would be-- although these things are very difficult to judge--that in the course of the next ten years or so, perhaps much sooner, the output will come down and down and down, to about 50 percent of what it was. Now, as I said, one can't be sure about these things, but that is the logic of facts. That we don't notice it yet is because certain accounts are being filled up; but the international banking system is already creaking with what used in the past to be called "hot money," money that hasn't found a permanent home and is being switched madly around. When there is a doubt about the value of the dollar, it rushes from New York to Frankfurt, and if then there is a doubt there, it goes to Tokyo, and then there is some trouble in Japan and it goes to Zurich, and so it rushes about: and of course the banking system can't really cope with it.

But that is just the first filling-up process. Any attempts to spend it are futile: even the most extravagant investment projects, like the subway in Teheran, take many years to implement, so the annual rate of expenditure is always a very limited one. It's just not possible to spend these funds, it's not possible to accommodate them in the sort of short-term deposits that absorb them currently. The oil-exporting countries are not willing to risk long-term investment and then expropriation. They will reduce output. And this means that, including of course the six fold increase in crude oil prices, this very, very short period in history of cheap and plentiful oil is now over.

Things don't change abruptly, but it's gone over the top, and the prospects are that from now on we shall have dear and scarce oil. If you accept this conclusion, then you have to ask yourself, During that very short and unique period in world history of cheap and plentiful oil, what happened as a result of the cheapness and plenty of oil? How did it crystallize out in our economic life? All those things that have happened as a direct result of cheap and plentiful oil now will be in great danger, the danger of collapse or disappearance when that economic base gradually is withdrawn.

What has become possible from cheap and plentiful oil, or more generally through cheap and plentiful fossil fuel? There is the modern system of agriculture, which is very highly oil-based. What you eat may be, physiologically speaking, all sorts of different foods: economically speaking, you eat mainly oil. (And most of the foods to be the case. We had farming systems in which the job increasingly taste like it) Of course, this didn't use that is now done by oil was done by the microbes in the ground, and biological or organic farming methods, with proper recycling and rotation and what have you. This proved the basis of man's existence, and still of course is in most parts of the world. But, since very little science had gone into it, it was rather stagnant. We have abandoned that, in the West, and have now a system based on chemicals, artificial fertilizers: so, instead of letting the microbes do the job, we let the Arabs do the job? Instead of a renewable resource, we have substituted a nonrenewable resource. People believe that the modern system of agriculture can feed mankind. Well, if we work this out in terms of energy, in terms of oil, if we attempted to feed something like four billion people on modern agricultural technology, then agriculture alone would utilize and absorb all known oil reserves in less than thirty years--agriculture alone.

Evidently this is not a system for world-wide application, and not a system of permanence: it's a short-term system. Consider phosphate. The main phosphate-exporting country is Morocco; and the Moroccans, like the oil-producing countries, have suddenly waked up and seen that this is a nonrenewable asset. Their phosphate deposits are also being exploited at increasing rates, and they can see the end within thirty years or so. The United States has its own phosphate deposits; whether I am rightly informed or not I don't know, but I hear they have made a major contract to export phosphate to the Soviet Union. If that is true, then you are past praying for, because this is one of the real bottlenecks in the agricultural situation on the basis of present modern agricultural technology. So it's not only oil; the whole problematique is now coming up with all basic nonrenewable resources except those, like sand, that are everywhere.

In other words, our task now is to rethink the whole situation. If we rethink agriculture, it is no longer permissible to say simply, This system is oil-dependent, but it works? To go about like that is to pretend to ourselves that the present system is in no way threatened and can continue forever and ever. But it can't. It's not a matter of choice; it's a matter of must. We must find a more organic system. We don't even have to argue for the more organic system in ecological or in nutritional terms; that is a sort of super-additive to our argument. This system is necessary whether you like it or not.

Another consequence of the short period of cheap and plentiful oil, of course, is the monster cities of today. We say to ourselves, Well, man needs a city; culture cannot arise out of subsistence farming; there has to be a sort of critical density of people to make mutual fertilization possible and produce the flowering of the human spirit. Cities have existed for five or six thousand years; but they could never grow beyond a very modest size. Why not? Because a big city doesn't live on itself, it lives on the land, it lives off the land. An inland city lives off the circle of land around it to be provisioned; and in the past that circle couldn't be very large, because the only transport energy was animal and man. Of course, a city situated by the sea could use one other transport energy, namely wind power, and therefore the biggest cities grew up on the seashore, where they could be provisioned by ships. And so we know of no city, until about a hundred years ago, that grew beyond something like two hundred or three hundred thousand people.

Then this bottleneck of how to provision a city was broken by man exploiting fossil fuels, first coal, then oil, and developing a transport

technology to use them, so that big cities could be provisioned from all over the world: the hinterland, as it were, of the city became the world. There was one limit to the growth of cities: if it takes eighty people to feed a hundred, then 80 percent of the people must stay on the land and only 20 percent can live in the cities. But, if there is a tremendous increase in the productivity per man--and in this context "man" embraces "woman"--so that five people can feed a hundred, then 95 percent of the people can live in cities and only 5 percent have to stay on the land. So the second precondition was the immense increase in the productivity per man in agriculture, which made the modern city possible.

The city itself is a huge machine which for its very breathing requires a constant, continuous input of energy, namely oil. What is to become of these cities? Even the fourfold increase of fuel prices is making city life more and more onerous and burdensome than it has ever been before. There is no use in referring cities to what we now have learned to call "income energies," like solar power, wind power, etc., because, while you can heat a house with solar energy very comfortably, you can't heat Rockefeller Center. In fact, solar energy plus wind power would not push the lifts up and down. And most of the: accommodation in Rockefeller Center is inaccessible if there are no lifts: fancy someone climbing thirty or fifty floors. That is what I mean by life becoming more and more burdensome.

So one has to foresee people leaving the cities and wanting to make a livelihood outside of the cities. Who can receive them? What economic systems are there into which they can escape? They can drop out of the cities, but what can they drop into?

Let's look at transport. The kind of transport that we are used to, of course, is thinkable only on the basis of cheap and plentiful oil. If you go to Detroit you will find a lot of Japanese cars flitting about--evidently, transport is cheap enough to get the car from Tokyo to Detroit and still be able to compete with cars made in Detroit. We in England also have Japanese cars; they are just taken as a symbol. When you travel up the big motor road from London you find yourself surrounded by a huge fleet of lorries carrying biscuits from London to Glasgow. And when you look across to the other motorway, you find an equally huge fleet of lorries carrying biscuits from Glasgow to London. Any impartial observer from another planet would come to the inescapable conclusion that biscuits have

to be transported at least six hundred miles before they reach their proper quality.

Why is this? Businessmen are not fools; in some sense it pays them to do so. How can it pay them? Of course, cheap and plentiful oil makes it easy; but there is something more behind it. Even a humble article like biscuits is produced in very large outfits, both in London and in Glasgow, which have a very high level of overhead costs. When you have a high level of overhead costs, then the marginal costs--the last packet of biscuits--are very cheap, because the whole caboodle has already been paid for by the other output. Just like, if you have a private boarding school, the first fifty boys pay for the teachers and the buildings and so on and so forth: and the proprietor makes money only off boys number fifty-one and fifty-two. So the marginal costs are a small fraction of the average cost.

Now, the chap in London says, I sell locally what I can sell, but that doesn't fully load up my capacity. And, in order to get it fully loaded up, the marginal costs are only a small fraction. So I can let my marginal product travel long distances--to Glasgow. Even if the transport costs absorb most of the difference between marginal cost and average cost, as long as there is something left it's profitable for me to do so. And he's quite right. Except that the Glasgow chap thinks the same, and he, in order to fill up his capacity, invades the London market. And so, while it is logical from the point of view of the one manufacturer in London and the one manufacturer in Glasgow, if you add it all together it's a total absurdity.

This is the fascination of economics, that there is a logic for business which in terms of the total sum can become an absurdity. That's what makes the subject interesting. But what I want to draw attention to is that this arises out of the large-scale production of these biscuits, and the large capitalization. As long as the mode of production is such that marginal costs are only a small fraction of average costs, you will get these phenomena, even with increased transport costs. It is one of the reasons, among many others, that I have reached the conclusion that large-scale production, all issuing- from one unit, is also a phenomenon due to cheap and plentiful oil, and is being brought into question as that period of cheap and plentiful oil draws to a close.

What would have to take its place? Instead of large-scale, highly complex and highly capital-intensive production let's see whether we can't have small

units that ipso facto would be so complex. But we would also try to find a much more simplified technology, and it wouldn't require such enormous accumulations of capital.

This would be a very different life-style. We have all been brainwashed by the experience of the nineteenth century, when, probably, the technological immaturity was such that it was true to say, "The bigger the better": only on a large scale can you get the economics of scale. But that was a very immature technology. Now this is no longer true. Today we have enough technological and scientific knowledge to make things small again. This is not a theoretical argument; it cannot be refuted or supported in terms of theory; it's just a matter of getting some people to make the necessary design studies. It may not be true in every field: I don't suppose that one could produce Boeing aircraft on a small scale. But let's begin with basic human requirements. And there I can't see anything that man really needs that cannot be produced very simply, very efficiently, very viably on a small scale with a radically simplified technology, with very little initial capital, so that even little people can get at it.

If you have a technological trend, as we've had for the last hundred years, for everything to become bigger and bigger, more and more complex, more and more capital-demanding, then of course more and more people get excluded. The thing is reserved for people already rich or powerful. Have the rich and powerful provided a slot into which the little chaps can fit? Some don't accept the First Commandment, "Thou shalt adapt yourself to slots"; they say, I want to do my own thing, I've got ability and brains and hands, and I want to make something--and then you find you can't, because you haven't got the capital that is needed. The technology has grown beyond the human scale. The question is, Can we bring it back to the human scale? This cannot be asserted or refuted on theoretical grounds, but only on the grounds of practical experience.

We have been at this, with an organization called the Intermediate Technology Development Group, for ten years. And wherever we have tried, we have found, yes, of course, it's perfectly possible. If we want to make cement--although the trend of the cement industry has been to go from small to ever, ever bigger, and now there are installations where half a million tons of cement a year are produced from one factory--if we use the know-how that we have and make the design study, we can have a mini-plant. And, instead of having one whopper plant in one place, making half a million, we

can have a hundred plants scattered around, where the resources are and where the demand is, to make a few thousand tons a year each. This can be done; it can also be done with bricks, it can be done with chipboard, it can be done wherever we've tried. It can be done.

2. Towards a Human-Scale Technology

What is the nature, what are the characteristics of this our actual, present-day industrial society? Everything has a many-sided nature and many characteristics; by what standards are we going to distinguish the essential from the nonessential? If I try to do this "in the light of the Gospel," I must first define how the light of the Gospel appears to me.

First of all, it seems to me, the Gospels tell us that life is a school, a training ground, and cannot therefore be understood simply in its own terms. The Great Head-master's idea seems to be that we should not merely be comfortable (although comfort as such is not to be despised) but should learn something, strive after something, and with His help become something more than we are. This something is generally called "the Kingdom of Heaven," and the method of attaining it is described as loving God and loving our neighbor as ourselves. But the whole essence of the education is that it should proceed in freedom, that the end product should be persons and not puppets.

I shall therefore try to consider the characteristics of industrial society from the point of view of this all-important task.

Before I do so, I feel I should remind myself of at least one of the great parables in the Gospels, the parable of the wheat and the tares. It suggests that it is part of the great design that they are allowed to grow up together. If we take this seriously, we must expect to encounter the coexistence, almost inextricably inter-mixed, of great good and great evil in our society. For the indications--the signs of the times--are that the season is now pretty far advanced and the time of the harvest, when the wheat will be separated from the tares, may not be far off.

What indications? What signs of the times?

I think there are many, of which I shall mention only one: the extraordinary increase in the rate of change. If you would draw a curve of the rate of change, it would appear as an exponential, or logarithmic, curve of continuous acceleration. It is quite clear that no such curve can proceed for any length of time on this earth. It must come to a stop before long, and that must mean the end of an era and "the revaluation of all values" or, in the imagery of the Gospels, the separation of the wheat from the tares.

Looking at present-day industrial society I should expect therefore to find, inextricably intermixed, great good and great evil. Very likely it is mainly a matter of temperament which of the two impresses you most. But any view or description that includes only the one or the other would be likely to miss an important part of the truth.

Modern industrial society is immensely complicated, immensely involved, making immense claims on man's time and attention. This, I think, must be accounted its greatest evil. Paradoxical as it may seem, modern industrial society, in spite of an incredible proliferation of labor-saving devices, has not given people more time to devote to their- all-important spiritual tasks; it has made it exceedingly difficult for anyone, except the most determined, to find any time whatever for these tasks. In fact, I think I should not go far wrong if I asserted that the amount of genuine leisure available in a society is generally in inverse proportion to the amount of labor-saving machinery it employs. If you would travel, as I have done, from England to the United States and on to a country like Burma, you would not fail to see the truth of this assertion. What is the explanation of the paradox? It is simply that, unless there are conscious efforts to the contrary, wants will always rise faster than the ability to meet them.

The widespread substitution of mental strain for physical strain is no advantage from our point of view. Proper physical work, even if strenuous, does not absorb a great deal of the power of attention, but mental work does; so that there is no attention left over for the spiritual things that really matter. It is obviously much easier for a hard-working peasant to keep his mind attuned to the divine than for a strained office worker.

I say, therefore, that it is a great evil--perhaps the greatest evil--of modern industrial society that, through its immensely involved nature, it imposes an undue nervous strain and absorbs an undue proportion of man's attention. Of course, it might be otherwise. It is still conceivable, for- instance, that hither-

to undeveloped countries might pick and choose what they wish to take over from Western industrialism, adopting only those things which really facilitate and enrich life while rejecting all the frills and harmful elaborations. But there is no sign of this happening anywhere in the world. On the contrary, it is cinemas, transistor sets, airplanes and such like which catch on much more quickly than anything really worthwhile.

Whether the tendency to raise wants faster than the ability to meet them is inherent in industrialism as such or in the social form it has taken in the West may be a debatable question. It is certain that it exists and that the social forms exacerbate it. Industry declares that advertising is absolutely necessary to create a mass market, to permit efficient mass production. But what is the great bulk of advertising other than the stimulation of greed, envy, and avarice? It cannot be denied that industrialism, certainly in its capitalist form, openly employs these human failings--at least three of the seven deadly sins--as its very motive force. From the point of view of the Gospels, this must be accounted the very work of the devil. Communism, which rejects and derides the Gospels, does not appear to be bringing forth anything better; its main claim is that it will shortly "overtake" (as they say) Britain or even America. British socialism once upon a time showed an awareness of this evil, which it attributed solely to the peculiar working of the private- enterprise-and-profit system. But today, I am afraid, British socialism has lost its bearings and presents itself merely as a device to raise the standard of living of the less affluent classes faster than could be done by private enterprise. However that may be, present-day industrial society everywhere shows this evil characteristic of incessantly stimulating greed, envy, and avarice. It has produced a folklore of incentives which magnifies individual egotism in direct opposition to the teachings of the gospel.

R. H. Tawney, one of the great ethical thinkers of our time, has spoken of "the straightforward hatred of a system which stunts personality and corrupts human relations by permitting the use of man by man as an instrument of pecuniary gain." The "system" he refers to is again our modern industrial society, and again it may be a debatable issue whether these evils are the result of industrialism as such or of the particular capitalist form in which it made its appearance in the West. I myself fear it is industrialism as such, irrespective of the social form. In what way does it stunt personality? Whatever Mr. Tawney may have had in mind, I should say: mainly by making most forms of work--manual and white-collared--utterly uninteresting and meaningless. Mechanical, artificial, divorced from nature,

utilizing only the smallest part of man's potential capabilities, it sentences the great majority of workers to spending their working lives in a way which contains no worthy challenge, no stimulus to self-perfection, no chance of development, no element of Beauty, truth, or Goodness. The basic aim of modern industrialism is not to make work satisfying but to raise productivity; its proudest achievement is labor saving, whereby labor is stamped with the mark, of undesirability. But what is undesirable cannot offer dignity so the working life of a laborer is a life without dignity. The result, not surprisingly, is a spirit of sullen irresponsibility which refuses to be mollified by higher wage awards but is often only stimulated by them.

In addition, industrial society, no matter how democratic in its political institutions, is autocratic in its methods of management. If the workers themselves were given more say in the organization of their work, they might be able to restore some interest and dignity to their daily tasks--but I doubt that they would. After all, they too, like everybody else, are members of modern industrial society and conditioned by the distorted scheme of values that pervades it. How should they know how to do things differently? It is a frequent experience that as soon as a workingman finds himself saddled with managerial responsibility he begins to develop an almost uncanny understanding for and sympathy with the current preoccupations of management. How, indeed, could it be otherwise? Modern industrialism has produced its own coherent system of values, criteria, measurements, etc.; it all hangs together and cannot be tampered with except at the risk of breakdown. If anyone said: "I reject the idolatry of productivity; I am going to ensure that every job is worthy of a man," he would have reason to fear that he might be unable to pay the expected wages or, if he did, that it would land him in the bankruptcy court. All the same, autocratic management, which treats men as "factors of production" instead of responsible human persons, is a grave evil leading to innumerable stunted or even wasted lives.

Maybe a type of industrial society could be developed which was organized in much smaller units, with an almost infinite decentralization of authority and responsibility. From the point of view of the Gospels, a hierarchical structure, i.e., authority as such, is not an evil. But it must be of a size compatible, so to say, with the size of the human being. Structures made up of, say, a hundred people can still be fully democratic without falling into disorder. But structures employing many hundreds or even

thousands of people cannot possibly preserve order without authoritarianism, no matter how great the wish for democracy might be.

There are four main characteristics of modern industrial society which, in the light of the Gospels, must be accounted four great and grievous evils:

1. Its vastly complicated nature.
2. Its continuous stimulation of, and reliance on, the deadly sins of greed, envy, and avarice.
3. Its destruction of the content and dignity of most forms of work.
4. Its authoritarian character, owing to organization in excessively large units.

All these evils are, I think, exacerbated by the fact that the bulk of industry is carried on for the purpose of private pecuniary gain. And, although some big business has civilized itself in recent years to a significant extent--largely owing to the "countervailing power" of the trade unions, in conditions of full employment-- there still remains a large fringe of big and small business which manifests the worst features of capitalist irresponsibility in an extreme manner. Perhaps the outstanding examples are to be found in the field of communication media--in sections of the press, the entertainment industries, book publishing, and so forth.

You may have read Richard Hoggart's *The Uses of Literacy*, which is a terrible indictment. The worst exploitation practiced today is "cultural exploitation," namely, the exploitation by unscrupulous moneymakers of the deep longing for culture on the part of the less privileged and undereducated groups in our society. The exhibition of reading matter on most of the bookstalls in industrial localities is--to my mind--the worst indictment of present-day industrial society. To claim that "this is what the people want" is merely adding insult to injury. It is not what they want, but what they are being tempted to demand by some of their- fellow men, who will commit any crime of degradation to make a dishonest penny.

These great and blatant evils are not on the decrease. On the contrary, they are spreading right across the world and all the time gaining in intensity. The modern industrial system has a built-in tendency to grow; it cannot really

work unless it is growing. The word 'stability' has been struck from its dictionary and replaced by 'stagnation'. Its continuous growth pursues no particular aims or objectives, it is growth for the sake of growing. No one, even inquires after its final shape. There is none, there is no 'saturation point'. Who, it may be asked, calls the tune? Fundamentally, the technologist. Whatever becomes technologically possible--within certain economic limits--must be done. Society must adapt itself to it. The question whether or not it does any good is ruled out on the specious argument that no one knows anyhow what is good or evil, wholesome or unwholesome, worthy of man or unworthy.

Professor A. Hill says in his book *The Ethical Dilemma of Science*: "To imagine that scientific and technical progress alone can solve all the problems that beset mankind is to believe in magic, and magic of the very unattractive kind that denies a place to the human spirit." What I wish to emphasize is that the modern industrial system does in fact just this and is effectively denying a place to the human spirit. Too much contact with machinery has convinced the masters of the system that economic development is a mechanical, i.e., unalterable, process which could only be thrown into disorder but never stopped or modified by the intrusion of value judgments.

In the face of this preponderance of evil, it may well be asked where one could hope to find even the smallest good.

As a Christian, I am not supposed to fall for the temptation of thinking so. It is the task and function of the devil to do the work of God. There must be some good in these processes, or else why should they be permitted to take place?

You will not expect me now to point to the external, temporal achievements of industrial society as the great good that has grown up alongside the evil, if I did so, I should be guilty of altogether forgetting the great warning in the Gospels: "What shall it profit a man if he shall gain the whole world and lose his own soul?" In the light of the Gospel we cannot but judge that these achievements profit us nothing because they are being purchased by throwing away the pearl of great price. If there is any good to be found, it must be a spiritual good. And I think it is not too difficult to find it.

We can note the gradual spread and establishment of certain basic notions of justice and freedom. Even the greatest evildoers find that they have to justify themselves hypocritically, and "hypocrisy"--as the Duc de la Rochefoucauld observed three hundred years ago--"is the homage paid by vice to virtue." Do not fail to notice the significance of all tyrannies today describing themselves as democracies, and all conquests as liberations, and all arbitrariness as the people's justice. This already is a great victory of light over darkness and a great step forward from the Machiavellian approval of every kind of political crime.

If life is a "school of becoming," a school of self-development, the ideas of personal freedom and personal responsibility must become ever more firmly established. It may be utopian to hope that they will ever gain universal mastery on this earth--because good and evil tend to grow together; but, as ideas, they can and, I am sure, will become so powerful that ever greater forces will need to be mobilized by the evil one to resist them. In the ages of slavery, serfdom, and capitalist exploitation at its worst, great masses of people never looked upon themselves as potentially free and responsible. It is different today, even in concentration camps, forced-labor camps, and the like. The average factory worker may make precious little use--or even very damaging use - of his freedom, but he is in no doubt that he has it and that it is a precious thing. No matter how much these ideas are being sinned against, there can be no doubt, I suggest, that, as ideas, they are today more firmly established than ever before. It is ideas that matter more than facts. It is not so long ago that ideas like colonialism, imperialism, "masters and men," and the like seemed perfectly reasonable; they do not any more. Many people, indeed, still argue against the practicability of freedom, of ensuring the dignity of the person, of self-determination, and so forth, but no one argues against the ideas as such.

All this is clearly visible when we look at the modern industrial system. It is indeed authoritarian and may become more so as the size of units increases. But neither the masters nor the men are any more taken in by authoritarianism. The masters are authoritarians if with a bad conscience; the men accept them only sullenly and only when they must. There are everywhere discussions on the social obligations of business. People realize that a firm is responsible not only to its shareholders but also to its employees, its customers, and the community as a whole. In Britain, we have a substantial public sector, in which determined efforts are being made to do justice to all, and institutional means have been devised to this end.

There are no shareholders; but the employees demand "accountability" through joint consultation, the customers through consumers councils, and the community through Parliament and the responsible minister.

From my point of view, it is not of decisive importance whether these arrangements work "better" or "worse" than undemocratic enterprise; they are better, because they are more in line with the meaning of human life than any wealth-producing machine--however successful--that is based upon and motivated by the acquisitive instinct.

Let us return to the thought that life is a school. As one advances in school the tasks and examinations become more difficult. But the problems set by the Great Schoolmaster also become more meaningful and more to the point. Modern industry, by producing comfort on a scale unheard of in human history yet almost destroying the real educational function of daily work, quite clearly sets the most difficult examination task: how not to lose sight of the spiritual in face of these overwhelming temptations. Many people--albeit a small minority--are rising to this task. I think we are living in an age of increasing polarization. A great mass of gray is being separated out into some very black and some very white units. As one might expect, the process seems most advanced in the United States; very great evils are coming all the time from over there (and we, in Europe, strive exceedingly hard to copy and adopt them). But make no mistake: there is also a great drive toward, and consciousness of, goodness in that turbulent society, more plain goodness, I think, than in Europe.

It is my personal belief that, speaking from a worldly point of view, industrial society, unless radically reformed, must come to a bad end. Now that it has adopted cumulative growth as its principal aim, its end cannot be far off. But that does not mean that it will have failed in its purpose from the point of view of the Gospel. Out of the tremendous examination set by this monstrous development many single individuals will emerge triumphant; uncorrupted and hence incorruptible. This is all that really matters.

This does not mean that we can wash our hands of this worldly failure; for only those can triumph who never cease for a moment, no matter what are the odds against them, to fight evil and try to restore order. "Woe unto the world because of offenses? for it must needs be that offenses come; but woe to that man by whom the offense cometh?" (Matthew 18:7). Anyone who merely "washes his hands" is one of those by whom offense comes.

Why should industrial society fail? Why should the spiritual evils it produces lead to worldly failure~ From a severely practical point of view, I should say this:

1. It has disrupted, and continues to disrupt, certain organic relationships in such a manner that world population is growing, apparently irresistibly, beyond the means of subsistence.

2. It is disrupting certain other organic relationships in such a manner as to threaten those means of subsistence themselves, spreading poison, adulterating food, etc.

3. It is rapidly depleting the earth's nonrenewable stocks of scarce mineral resources--mainly fuels and metals.

4. It is degrading the moral and intellectual qualities of man while further developing a highly complicated way of life the smooth continuance of which requires ever-increasing moral and intellectual qualities.

5. It breeds violence--a violence against nature which at any moment can turn into violence against one's fellow men, when there are weapons around which make nonviolence a condition of survival.

It is no longer possible to believe that any political or economic reform, or scientific advance, or technological progress could solve the life-and-death problems of industrial society. They lie too deep, in the heart and soul of every one of us. It is there that the main work of reform has to be done--secretly, unobtrusively. I think we must study nonviolence deep down in our own hearts. It may or may not be right to "ban the bomb." It is more important to overcome the roots out of which the bomb has grown. I think these roots are a violent attitude to God's handiwork instead of a reverent one. The unsurpassable ugliness of industrial society--the mother of the bomb - is a sure sign of its violence. "Blessed are the patient; they shall inherit the land," and "Blessed are the peacemakers; they shall be counted the children of God." (Matthew 5:5,9, Knox translation.)

I shall be asked to declare what any one of us can do in this very difficult situation. What did Christians do during the breakdown of the Roman Empire? They did not run away but went to work cheerfully among the

apparent doom. The degeneration of the industrial system--that is, its ever-intensified idolatry of getting rich quickly--offers everywhere ample opportunities for bringing light into dark places. Everywhere the values of freedom, responsibility, and human dignity have to be openly affirmed, even where a neglect of these values would appear to allow the big industrial machine to run more smoothly and more efficiently. It may not be possible to do this without causing offense. To tell a young person that his personal integrity is more important than his career may sound almost like sabotage in the ears of the efficiency experts. To insist that the reckless waste of natural resources is a crime does not sound cooperative to those who think that the highest possible rate of consumption is the only worthwhile pursuit for mortal man.

It is the individual, personal example that counts. The greatest "doing" that is open to every one of us, now as always, is to foster and develop within oneself a genuine understanding of the situation which confronts us, and to build conviction, determination, and persuasiveness upon such understanding. Let us face it, to look at modern industry in the light of the Gospels is not the fashion of the day, and the diagnosis I have given here is not acceptable, at this point in time, to the great majority of our contemporaries. What, then, is the use of asking for a "program of action"? Those who have understood know what to do. They also know that, although in a minority, they do not stand alone.

Few people deny that technological change has political consequences; yet equally few people seem to realize that the present "system," in the widest sense, is the product of technology and cannot be significantly changed unless technology is changed.

The question may be asked: What is it that has produced modern technology? Various answers can be given. We may go back to the Renaissance, or even further, to the arising of Nationalism, and point to certain changes in Western man's attitude to religion, science, nature, and society, which then apparently released the intellectual energies for modern technological development. Marx and Engels gave a more direct explanation: the rising power of the bourgeoisie, that is, "the class of modern capitalists, owners of the means of social production, and employers of wage labor."

The bourgeoisie, wherever it has not the upper hand, has put an end to all feudal, patriarchal, idyllic relations. It has pitilessly torn asunder the motley feudal ties that bound man to his "natural superiors, and has left no other bond between man and man than naked self-interest, than callous "cash payment."

It compels all nations, on pain of extinction, to adopt the bourgeois mode of production. The bourgeoisie has subjected the country to the rule of the towns. It has created enormous cities, has agglomerated population, centralized means of production, and has concentrated property in a few hands.

If the bourgeoisie did all this, what enabled it to do so? The answer cannot be in doubt; the creation of modern technologies. Once a process of technological development has been set in motion it proceeds largely by its own momentum, irrespective of the intentions of its originators. It demands an appropriate "system," for inappropriate systems spell inefficiency and failure. Whoever created modern technology, for whatever purpose, this technology or, to use the Marxian term, these modes of production, now demand a system that suits them, that is appropriate to them.

As our modern society is unquestionably in crisis, there must be something that does not fit. (a) If overall performance is poor despite brilliant technology, maybe the "system" does not fit. (b) Or maybe the technology itself does not fit present-day realities, including human nature.

Which of the two is it? This is a very crucial question. The assumption most generally met is that the technology is all right-or-can be put right at a moment's notice--but that the "system" is so faulty it cannot cope:

Modern bourgeois society with its relations of production, of exchange and of property, a society that has conjured up such gigantic means of production and of exchange, is like the sorcerer who is no longer able to control the powers of the nether world whom he has conjured up. The relations of bourgeois society are too narrow to comprise the wealth created by them. And how does the bourgeoisie get over these crises? On the one hand by the enforced destruction of a mass of productive forces; on the other, by the conquest of new markets and by the more thorough exploitation of the old ones. That is to say, by paving the way for more extensive and more

destructive crises, and by diminishing the means by which crises are prevented. (Marx and Engels: *Manifesto of the Communist Party*, 1848.)

The culprit is the capitalist system, the profit system, the market system, or, alternatively, nationalization, bureaucracy, democracy, planning, or the incompetence of the bosses. In short: we have a splendid train but a bad track or a rotten driver or a lot of stupid, unruly passengers.

Maybe all this is quite true, except that we do not have such a splendid train at all. Maybe what is most wrong is that which has been and continues to be the strongest formative force--the technology itself.

If our technology has been created mainly by the capitalist system, is it not probable that it bears the marks of its origin, a technology for the few at the expense of the masses, a technology of exploitation, a technology that is class-orientated, undemocratic, inhuman, and also unecological and nonconservationist?

I never cease to be astonished at the docility with which people- even those who call themselves Socialists or Marxists--accept technology uncritically, as if technology were a part of natural law. As an example of this "docility" we may take the Prime Minister of Iran, who is reported to have said in a recent interview (To the *Point International*, January 12, 1976): There are many aspects of the West that we particularly wish to avoid in the industrialization of Iran. We seek the West's technology only, not its ideology. What we wish to avoid is an ideological transplant.

The implicit assumption is that you can have a technological transplant without getting at the same time an ideological transplant; that technology is ideologically neutral; that you can acquire the hardware without the software that lies behind it, has made the hardware possible, and keeps it moving. Is this not a bit like saying: I want to import eggs for hatching, but I don't want chicks from them but mice or kangaroos'

I do not wish to overstate the case; there is nothing absolutely clear-cut in this world and, no doubt, many different tunes can be played on the same piano; but whatever is played, it will be piano music. I agree with the general meaning of Marx's rhetorical question: Does it require deep intuition to comprehend that man's ideas, views, and conceptions--in a word, man's consciousness changes [he does not say: is totally determined] with every

change in the conditions of his material existence, in his social relations and in his social life?

It is a great error to overlook or to underestimate the effects of the "modes of production" upon people's lives, not just their "standard of living":

- how they produce; what they produce;
- where they work; where they live; whom they meet;
- how they relax or "recreate" themselves; what they eat, breathe, and see;
- and therefore what they think, their freedom or their dependence.

Adam Smith was under no illusion about the effects of the "mode of production" on the worker: The understandings of the greater part of men are necessarily formed by their ordinary employments. The man whose whole life is spent in performing a few simple operations..... has no occasion to exert his understanding..... He naturally loses, therefore, the habit of such exertion and generally becomes as stupid and ignorant as it is possible for a human creature to become..... But in every improved and civilized society this is the state into which the laboring poor, that is, the great body of the people, must necessarily fall, unless government takes some pains to prevent it.

Marx comments that "some crippling of body and mind is inseparable even from division of labor in society as a whole. Since, however, manufacture carries this . . . much further and also, by its peculiar division, attacks the individual at the very roots of his life, it is the first to afford the materials for, and give start to, industrial pathology." And he quotes his contemporary, D. Urquhart, who says: "The subdivision of labor is the assassination of a people."

People still say: It is not the technology; it is the "system." maybe a particular "system" gave birth to this technology; but now it stares us in the face that the system we have is the product, the inevitable product, of the technology. As I compare the societies which appear to have different "systems," the evidence seems to be overwhelming that where they employ the same technology they act very much the same and become more alike

every day. Mindless work in office or factory is equally mindless under any system.

I suggest therefore that those who want to promote a better society, achieve a better system, must not confine their activities to attempts to change the "super- structure" rules, agreements, taxes, welfare, education, health services, etc. The expenditure incurred in trying to buy a better society can be like pouring money into a bottomless pit. If there is no change in the base--which is technology--there is unlikely to be any real change in the superstructure.

People say to me: Before you can make headway with your intermediate technology you must first change the system, do away with capitalism and the profit motive, dissolve the multinationals, abolish all bureaucracies, and reform education. All I can reply is: I know of no better way of changing the "system" than by putting into the world a new type of technology-technologies by which small people can make themselves productive and relatively independent.

Or is there a better way? If so, let's have it. Expansion of nationalization, welfare, redistributive taxation? Local government reform? Changes in political representation? Planning? Yes, all these things have their points, and we have had plenty of them, and the more things change the more they remain the same, unless they get worse.

During the eighteenth and nineteenth centuries technology just grew like topsy. Increasingly, however, it became the outgrowth of science. Today, its primary derivation is from science; in fact, it appears that science is today mainly valued for its technological fruits.

Starting, then, with science, the question may be raised: What determines the course of science? There is always more that could be studied than can be studied; so there is need for choice, and how is it made?

By the interests of scientists? Yes, unquestionably.

By the interests of big business and government? Surely yes.

By the interests of "the people"? On the whole, no? The people have fairly simple requirements to meet for which hardly any additional science is

needed. (It could be that an entirely different kind of science would really benefit the people; but that is another matter.)

Moving on from science to technology, there is again far more that could be done than can be done. The choice is endless. Who decides or what decides? Scientific findings can be used for, incarnated in, countless different shapes of technology, but new technologies are developed only when people of power and wealth back the development. In other words, the new technologies will be in the image of the system that brings them forth, and they will reinforce the system. If the system is ruled by giant enterprises--whether privately or publicly owned--the new technologies will tend to be "gigantic" in one way or another, designed for "massive breakthroughs," at massive cost, demanding extreme specialization, promising a massive impact--no matter consequences." The slogan is "A breakthrough a day keeps the crisis at bay." We hear of "white hot technological revolution," the Nuclear Age, the Age of Automation, the Space Age, fantastic feats of engineering, supersonic triumphs, all that; but many of the most basic needs of great masses of people, such as housing, cannot be taken care of.

The most telling example, of course, is the most advanced society of the modern world, the United States. Average income per head is over twice that of Britain or Western Europe, and yet there is more degrading poverty in the States than you can ever see in Europe; 5 or 6 percent of the world population using something like 35 percent of the world's output of raw materials--and not a happy place: great wealth in some places but utter misery, degradation, hopelessness, strife, criminality, escapism, sickness of body and mind almost everywhere; it is hard to get away from it. How is it possible--in a country that has more resources, more science and technology than anybody ever had in human history? People are questioning everything, every part of the superstructure--big business, big government, big academia; and very gradually, hesitantly, at long last they are beginning to question the basis of it all--technology.

Technology assessment groups have sprung up in various places; they "assess" technological developments mainly in the light of three questions: What does it do in terms of resource usage? What does it do to the environment? Concorde did not fare well under their scrutiny. They concluded that it was wasteful of scarce resources, environmentally burdensome and even dangerous, and socio-politically irrelevant. It may

nonetheless be described as a marvelous achievement of Anglo-French engineering.

Let us follow through a few of the structural effects of modern technology. Its effect on the nature of work has already been referred to. It is, I believe, the greatest destructive force in modern society. What could be more destructive than the destruction of people's understanding? Matters have not improved since Adam Smith's time; on the contrary, the relentless elimination of creative work for the great majority of the population has proceeded apace.

What has been the effect of modern technology upon the pattern of human settlement? This is a very interesting subject which has received hardly any attention. The UN and the World Bank produce indices of urbanization, showing the percentage of the population of different countries living in urban areas (above a certain size). The interesting point is that these indices entirely miss the interesting point. Not the degree but the pattern of urbanization is the crux of the matter. Human life, to be fully human, needs the city; but it also needs food and other raw materials gained from the country. Everybody needs ready access to both countryside and city. It follows that the aim must be a pattern of urbanization so that every rural area has a nearby city, near enough so that people can visit it and be back the same day. No other pattern makes human sense.

Actual developments during the last hundred years or so, however, have been in the exactly opposite direction: the rural areas have been increasingly deprived of access to worthwhile cities. There has been a monstrous and highly pathological polarization of the pattern of settlements. The French planners fight against France becoming "Paris surrounded by a desert," in the United States they have coined the term "megalopolis" to describe the vast conurbations which have arisen while the life has been seeping out of small and medium-sized country towns. There is Boswash extending from Boston to Washington, D.C.; there is Chicpitts, a conurbation stretching from Chicago to Pittsburgh; and there is Sansan, from San Francisco to San Diego. Even in the United Kingdom, often referred to as a tightly packed little island, the pattern of settlement is extraordinarily lopsided, with more than half the area grossly underpopulated and large parts of the other half madly congested.

Do you remember this socialist demand, formulated more than one hundred years ago?

Combination of agriculture with manufacturing industries; gradual abolition of the distinction between town and country by a more equable distribution of the population over the country. (*Communist Manifesto.*)

And what has happened during those more than one hundred years? Of course, the exact opposite. And what is expected to happen during the next twenty-five years, to the end of the century? Again the exact opposite, with a vengeance. Not urbanization but, to use a word as dreadful as the phenomenon it denotes, megalopolitanization, a movement that produces, as we know only too well, utterly insoluble political, social, moral, psychological, and economic problems.

A paper issued by the World Bank speaks of the despondency surrounding the task of ameliorating urban conditions in the developing countries [which] arises primarily from the speed of urban growth and shortage of resources, human as well as financial.

Urban administration is woefully lacking in capacity to deal with the problems.

Yet within less than twenty years the present populations and areas of urban centers will account for less than a third of the total.

The paper asks whether there is a possibility "of accelerating the development of small and medium-size towns or creating new urban growth centers." But it loses little time in dismissing this possibility:

Most small urban centres lack the basic infrastructure of transport and services.... Management and professional staff are unwilling to move from the major cities.

This tells the whole story: Management and staff are unwilling to move from the major cities? The proposition, evidently, is to transplant into a small place the technology which has been developed in such a way that it fits only a very large place. The people in the small place cannot cope with it; management and staff have to be structure of transport and services imported from the "major cities," no one wants to come because the

proposition does not make economic sense. The technology is inappropriate and that means the whole project is uneconomic.

With a name like mine, I find it easy to understand that to be a good shoemaker it is not enough to know a lot about making shoes; you also have to know about feet. The shoe made for the big fellow does not fit the foot of the little fellow. The small foot needs a different shoe, not an inferior one but one of the right size. Modern technology, generally speaking, makes good shoes only for big fellows. It is geared to mass production; it is highly sophisticated and enormously capital-costly. Of course it does not fit anywhere but in or near the biggest cities or megalopolitan areas.

The simple answer to this problem does not seem to have occurred to many people. It is: let us mobilize at least a small part of our intellectual and other resources to create a technology that does fit the smaller places.

Incredible amounts of money are being spent in trying to cope with the relentless growth of megalopolitan areas and in trying to infuse new life into "development areas." But if you say, Spend a little bit of money on the creation of technologies that fit the given conditions of development areas, people accuse you of wanting to take them back into the Middle Ages.

One thing, however, can be asserted with confidence: unless suitable, appropriate technologies for efficient production outside the main conurbations are created, the destructive tendencies of megalopolitanization will continue to operate with all that this implies socially, politically, morally, environmentally, and resource-wise.

Having traced the effect of modern technology upon the nature of work and the pattern of human settlement, let us now consider a third example, a highly political one, its effect on human freedom. This is undoubtedly a tricky subject. What is freedom? Instead of going into long philosophical disquisitions, let us ask the more or less rebellious young what they are looking for.

Their negations are such as these: I don't want to join the rat race. Not be enslaved by machines, bureaucracies, boredom, ugliness.

I don't want to become a moron, robot, commuter.

I don't want to become a fragment of a person.

I want to do my own thing.

I want to live (relatively) simply.

I want to deal with people, not masks.

People matter. Nature matters. Beauty matters. Wholeness matters.

I want to be able to care.

All this I call a longing for freedom.

Why has so much freedom been lost? Some people say, Nothing has been lost; but people are asking for more than before. Whichever way it is: there is a gap between supply and demand of this most precious thing--freedom. Has technology anything to do with this? The size and complexity of organizations certainly has a great deal to do with it. Why is the trend of the last hundred years toward bigger and bigger units? Nobody, except a few monomaniac tycoons, likes them. Why do we have to have them? The invariable answer is: Because of technological progress.

What we have to do now is not abandon technology, but become conscious of somewhere having taken a wrong turn. Under the influence of fossil fuel at throwaway prices, technology has taken the wrong turn, I suggest, in four directions.

First of all, there is a trend for everything to become bigger and bigger. (We call this quality "economies of scale.") This applies of course on the organizational level, but also on the purely technical level the units become bigger and bigger. The normal and standard size of brickworks in the nineteenth century produced ten thousand bricks a week. By the turn of the century it had risen to a hundred thousand bricks a week; today the standard size is between one and two million bricks a week. And now the Shah of Iran wants a five-million-bricks-a-week brickworks. That is one tendency, toward what I call gigantism.

The second tendency is that things are becoming, are made, ever more complex. The complexity of equipment, the ingenuity that is invested in

quite humble things, is fantastic. I haven't seen it with my own eyes, but I was told that if you really want to be "with it" you should go and buy a tube of toothpaste--you squeeze it, and the toothpaste comes out in three different luscious colors. And it's so clever they don't even get mixed up; it's like a flag coming out in three colors. But also, the other day I traveled in a car, and of course the boy who still survives in every man rejoices, because I was not subjected to the indignity of having to turn a handle to wind the window up or down, but I had to press a button. And I had a job to find the other button to get the thing down again?

Why this complexity? This complexity is a kind of disease. Even if it's not a question of cost, you can avoid its being immensely costly only by handing this production over to mindless machines, and mass-production machines. And also, of course, the more complex a thing is the more it tends to break down, and then where are you headed? You can't possibly repair it yourself, it's too complex. So you take it to a garage, and it costs you \$150, not to mention how long the car might be immobilized.

I traveled in the winter in Germany with a friend who had a splendid Mercedes, but the electrical system had developed a small fault and all the windows were stuck in different positions. He drove from garage to garage but there was no one who could penetrate the system, and all winter he drove in an icy blast. Finally in the spring he found someone to repair it for \$300. Is that a price worth paying so you don't have to turn the handle?

We joke about this but it is an extremely serious matter--that technology, although it was created by man, has become a force of its own; it has shaped man, a vast number of men, into little parrots that twitter and push and scrape to make things more and more complicated. And when they have found something that can actually be done, no matter how futile or dangerous it may be, such as Concorde or nuclear power, then they create a kind of Mafia to see that it gets done.

The third point is connected with the first and second. Things have become so capital-costly that you have to be already rich and powerful before you can really do anything. This is a very serious matter: for instance, to give only one example and not the prime example, take agriculture. You have highly scientific, highly chemicalized farming in very large units, and it is an outstanding fact that, if one wants to live off the land, supplying himself and his family with the wherewithal, he needs to be of quite

exceptional industry and intelligence to make a very humble living. All the research has gone in the opposite direction, to ever-greater capital requirements. To start a farm on the established system, even if you believe in the established system, is so capital-intensive that you have to be rich to do it. So more and more people get excluded. This of course hits most massively the poor countries, who find that they can't do most of the things because they are so capital-intensive. An intermediate technology that would not require this capital is not readily available; so they are excluded. Then they are told just to go on buying it from the rich countries. And the fact is, with their developing they are becoming not more independent but more dependent.

The fourth criterion of this technological development I would call violence. When you look at it from this point of view, and widen the concept of violence beyond human warfare, you find--and ecologists have confirmed it--an ever-increasing warfare against nature, and violent attitudes: the belief that science can do everything, and so you can go bullheadedly along, dumping poisons in ever-increasing quantities on this thin film around the globe, on which all life depends. If there are any unwanted side effects, science will deal with them. Or take medicine: the whole direction has been one to increasing violence. I know even from very sad family experience that the number of people who are the victims not of their diseases but of the cures prescribed for them is very great, and the damage done is often totally irreparable. Whereas preventive medicine is still virtually totally neglected. A very clever chap once said that if an ancestor of long ago would visit us today, what would he become astonished at: the skill of our dentists or the rottenness of our teeth? This is a very neat way of putting it; it shows we cannot reject, we have to be grateful for the skill of our dentists, because of the rottenness of our teeth. This is a mutual escalation: our teeth are still more rotten, and we are still more grateful for the dentists. A nonviolent approach to it would put the best of human intelligence into resolving the question Why are our teeth so rotten?

If this is a correct diagnosis of the development of the last hundred years--ever-bigger size, ever-bigger complexity, ever-bigger capital intensity, and ever-bigger violence then it would seem to follow that the cure must be sought in the opposite direction. But the cure is not found necessarily by going back, because in a hundred years, in the only knowledge that can accumulate, namely scientific knowledge, knowledge of dead matter really--there will be a great deal of progress. And things that were not possible to do

very easily on a small scale in the nineteenth century we can do on a small scale now. But not when the engineers have been brainwashed and educated all their lives in the opposite direction, so they don't believe it. It is possible to make things smaller--I'm not saying in every instance, but as regards all basic human requirements.

Second, it is possible to do many things in a much simpler way. Any third-rate engineer can make a complicated apparatus more complicated, but it takes a touch of genius to find one's way back to the basic principles, which are normally fairly simple. I'm not saying that the good Lord has arranged the world everywhere in a simple manner. No, no, He has distributed quite nicely to keep us alert. We have to use our brains.....But certainly not in the way we are doing now. Once we go and get down to work, we find we learn to distinguish what is essential and what are sort of almost cancerous growths, almost cancerous. If you think in these terms, and look at modern machine tools, you then learn to distinguish between the tool and the machine tool. That, of course, should be the best that human ingenuity can make, and normally it is a very simple thing.

And third, if one realizes that the immense capital requirements are a principle of exclusion, are totally incompatible with any ideas of justice or equality, then one will systematically search for cheaper ways of doing things. I mentioned before the little boy in every man; I suppose there is a little boy even in every woman, not only a little girl. There is nothing more beautiful to me than tools; in fact, I always have to restrain myself from buying any number of tools, and have to remind myself that I wouldn't be able to find the time to use them. But I like the feeling of having good tools around--my tools are all kept in my study. ...That is really intelligence, a tool. A machine? It is perhaps a tool, but it's not a tool operated by man; it's a tool operated by a mindless mechanism. And these mechanisms become bigger and more complex, and more and more attuned to mass production, and then they become immensely expensive.

Henry Ford started the Ford Motor Company with a capital of \$30,000. The dollar has gone down in purchasing value, mark it down by whatever you like-- mark it down by three, or four, or five, you have \$100,000. At a cost of \$ 100,000 you cannot change one screw in a modern motorcar. To have a new model now costs \$300,000,000 and takes four years of preparation. Who can afford it? I can't.

But, when Ford started, it was uncertain whether the steam engine wasn't better than the petrol engine: he could have switched from a petrol engine to a steam engine in the shortest possible time without disturbing anybody, and for very little money. Can't we look back in that direction? Can't we think more in terms of tools and learn to distinguish tools from machines, create facilities for people to become productive who have got it in them to do that which may then turn out to be extremely viable.

And fourth, if the thing has gone in the direction of violence, let's look in the direction of nonviolence. Nonviolence, in this context, refers to modes of production which respect ecological principles and strive to work with nature instead of attempting to force their way through natural systems, in the conviction that unintended damage and unforeseen side effects can always be undone by the further application of violence. All too often one problem is "solved" by creating several new ones. Poor societies cannot afford this kind of violence, and it may indeed be doubted whether the rich societies (or "sectors") can afford it much longer.

These four criteria or "guidelines" for new technological research and development may not appeal to everyone; all that can be said in their favor is that they have arisen out of actual work, not simply out of theorizing. Experience shows that whenever you can achieve smallness, simplicity, capital cheapness, and nonviolence, or, indeed, any one of these objectives, new possibilities are created for people, singly or collectively, to help themselves, and that the patterns that result from such technologies are more humane, more ecological, less dependent on fossil fuels, and closer to real human needs than the patterns (or life-styles) created by technologies that go for gigantism, complexity, capital intensity, and violence. It is incumbent on those who reject these criteria or guidelines to come forward with another set; because as long as there are no guidelines the search for alternatives cannot even begin.

Now this is real work. And the sooner we start this work on a systematic basis, the better. I rejoice in the fact that many people are starting, or have been active even for a number of years. But what now needs to be done is to make sure that we, whose strength is very small, don't all reinvent the wheel, that we get into such relationships that we can learn from one another and benefit from each other's experience.

I'll give you an example of real work, of nonviolent technology. I was asked by the President of Zambia to visit his country, and he received me at the state house. There he was sitting with his cabinet and he was holding a sheaf of papers in his hand and introduced me quickly and said, "This is why we have asked you to come, what do we do? I have been stumping the country with our Five Year Plan, I have told everybody this is now the Bible'-and then with a grand gesture he threw the papers on the floor and said, "I now realize it was the wrong Bible."

What is wrong with it? It applies only to the cities around the Copper Belt, and to Lusaka, the capital, while wide rural areas are totally left out. One of the things the Zambian government was particularly interested in was improving nutrition: they don't starve there, but there is a lot of malnutrition because of what they call the "protein gap." To fill the protein gap, they had a slogan: "One egg a day for every Zambian." And they were building up egg production quite successfully. I visited a lot of these farmers, and I found them weeping over their eggs, which were covering the floors of their sheds. "What are you doing with them, are you hatching them, or what?" "No, we haven't got any packaging material to send them to market. The supply of egg trays--which used to come from South Africa, from Britain, from America--has somehow stopped, and we have nothing to do with these eggs. We can't take them to market in our trouser pockets. What are we to do? They are just rotting."

Lighthearted as I normally am, I said, "Well, why don't you make egg trays in Zambia?" Of course, nobody in Zambia knew how to do it, nor did I. Coming back to London, we investigated. We found that virtually all the egg trays in the world are made by one multinational company. We contacted the European branch of this multinational company, and they said, "No problem? I mean, we'll build a factory in Lusaka-- how many do they want~" "Well, a rough calculation suggests about a million a year. It's a very small population, right in the beginning of development."

Long pause "Forget it. The smallest machine makes a million a month. So, unless you can somehow organize an All-Africa Common Market for Egg Trays, and build the roads for the lorries all coming out of Lusaka, to distribute the egg trays to the rural areas . ." I said, "But this is the very opposite of helping people, the opposite of development, just to refer them to foreign trade, to importing stuff. Why don't you make a small

plant? " "Oh no, we get many requests for small units, but our engineers say it would be totally uneconomic."

It was no go with them. We got a young fellow and gave him two jobs: first of all to redesign the egg tray,

which we considered very badly designed. (The multinational company does big business, but they don't seem to have a very good designer: when you fill the egg trays and put one on top of the other, the whole thing wobbles, and you still have to crate it to ship it, and crating is very expensive.) This job was taken to the Royal College of Art in London and within six weeks we had the perfect design, a perfectly stable assembly--tie it together with a string, ship it like that, not a single egg gets broken.

The second assignment was more difficult: to create a mini-plant. We did this with the Engineering Department of the University of Reading. It was going back to first principles, the sort of work that any think tank does, not to start from where others have got to. The prototype was built and we found a small manufacturer. That plant has 2 percent of the capacity of the hitherto smallest plant, and 2 percent of the capital cost; and it's totally compatible. And now, what was the reaction of the formidable dinosaur, the multinational company, of whom so many of my young colleagues are terrified? They said, "Well, you know, we want to remain the kings of egg trays--that is our ambition in life. We have agreed that the small scale requirements we cannot meet--couldn't we come to some agreement? " They said, below this line of size it's yours, above that, it's ours. And in return for the privilege that they can remain the kings of egg trays, and not be disturbed by the little princes like myself, they gave us access to some of their know how at the most ticklish points in the works, namely the mold which forms the egg tray. A healthy cooperation has developed between the whale and the sardine.

I mention only this case but I could go on for a long time. Nobody should think this is a dream; this is an activity. This is possible. And while I am not suggesting that we could have a simplified technology to land people on the moon, I am suggesting that our experience implies that on all real human requirements that can be the case. And if we don't land people on the moon, I don't think the loss will be overwhelming. (I myself was initially quite in favor of the program and had quite a list of people. But when I found they all had to come back again I couldn't see the point of it.)

These are just a few indications of what I know can be done and needs to be done now. It requires systematic work. I don't think it requires a large part of the resources of a rich society. I would say 95 percent of the research and development people can play their games as before, but 5 percent should be diverted relevant to the future. Not that I would limit it to that, I would be happier if the percentage was greater; I just want to indicate how modest my proposals are. Small amounts are normally more difficult to mobilize than large.

All this is not just a spinning of theories, although everything has to begin by theories. This is now backed up by work, work that has been carried on over ten years and has spread to many places in the world. It has spread also inside the U.K. where people say we need a different technology. This is not a recession. This is an end of an era. There's rising unemployment. These unemployed will not be automatically reabsorbed into these highly capitalized jobs. What is to become of them~ While the unemployment rises, the budgetary allocations are cut down. All sorts of needful things are not done. We are not going to go on waiting for Godot, and Godot never comes. In other words, we are not going to go on waiting for the central government. We are going to stand on our own two feet and do within the context of our community what needs doing. This sort of self-remembering is now coming, and people are realizing that in order to make what needs doing efficient and effective one must engage intellectual resources to create an appropriate, suitable technology. Recently I saw a film of Gandhi when he came to England in 1930. He disembarked in Southampton and on the gangway he was already overwhelmed by journalists asking questions. One of them asked, "Mr. Gandhi, what do you think of modern civilization? " And Mr. Gandhi said, "That would be a good idea." I think now the time has come when we can implement this good idea.

If one actually, consciously engages in work in these four directions-not all four may be feasible all at once one can also mobilize support from people who are going hell for leather in the opposite direction, because they are all a bit rattled. Of course if one simply says, What you are doing is terrible and you are this or that, and denounces it, then one doesn't get the best cooperation. But one can convince, if not the organizations, at least people in the organizations, that some- thing, some reorientation, is necessary and that they have the resources and they can do it without any strain.

My formula for this is a lifeboat. I have persuaded some big farmers in England to have a lifeboat, to separate out a bit of their land, which they don't need for making a living--they make their living on 95 percent of their land, and take 5 percent and run this as an organic unit or experimental unit to try to minimize their dependence on a very sophisticated and vulnerable industrial system. Well, after some persuasion this is actually happening. They are hard up as to who is going to manage this, because we haven't trained any people in non-chemical methods of farming. And of course it is harder now than it was fifty years ago, because the standardized farming, the chemicals, virtually irrespective of the quality of the soil, has lost us the traditional knowledge. Oh no, for this spot of land you take this and for that you take that, otherwise you get infestation. Why worry about infestation? You've got insecticides. Otherwise you get overrun with weeds. . Why worry about that~ We've got herbicides, etc. Or this is a poor soil and that is a rich soil--well, why make a distinction! We have chemicals; we don't grow plants out of the soil, we grow them out of chemicals.

With this attitude, this standardization, this unification, the knowledge of how really to cooperate with the soil is very largely lost. It has to be regained. It's much more difficult now but still it can be done.

If we engage in this work and do it intelligently, and are clever enough to engage people who at first sight might be our enemies, then I find it's not going to be very difficult and not going to be all that lengthy. If there were enough people, I think we could have an alternative technology, alternative possibilities, absolutely established over the whole range of basic human requirements. This is a finite job.

But people say, That's all very nice, but really technology, that has nothing to do with it, that's just tinkering. You have to change the system, or you have to change the philosophy, or how do you change human nature, or how do you stop the population growth? There are all sorts of things we can do, I mean we, now, not in the abstract, as we are also sitting here--and there are other things we can't do. One of the greatest confusions, in most discussions, is the term "we." You know, people say, We ought to decentralize General Motors. I look at them--I couldn't decentralize the drugstore on the corner? Or we ought really to change human nature--they couldn't even change their own nature? When I say "we" I am asking what can actual people, small as they are, what can they do?

If you look at it this way, you find that if one could make visible the possibility of alternatives, viable alternatives, make a viable future already visible in the present, no matter on how small a scale, even if it's only with a Scott Nearing--then at least there is something, and if that something fits, it will be taken. Suddenly there will be demand. If one establishes something, then one gets the benefit that this technology is not simply made by man but it also makes men. A type of technology that is not born out of the system we deplore will create a system we can approve of. If little people can do their own thing again, then perhaps they can do something to defend themselves against the overbearing, big ones.

So I certainly never feel discouraged. I can't myself raise the winds that might blow us, or this ship, into a better world. But I can at least put up the sail so that, when the wind comes, I can catch it.

3. A Viable Future Visible in the Present

It's not useful to talk about capitalism or socialism or nationalization unless one knows what one is talking about. After all, the economy consists of many very different bits and pieces. I have come to the conclusion that where you have lots of small businesses filling all sorts of demands, they do not constitute a social problem. They don't individually have a tremendous impact on the society. The best organization for them is private enterprise. If they employ a dozen people, the danger that the employer may exploit the workers can be perfectly well looked after by the unions. This is a very clear-cut matter; where the person who is responsible for the assets is identified, there is a real existential relationship between man and matter, material. Where countries have tried to socialize or nationalize those small businesses, the result was that you just couldn't get the work done any more. Also, the urge of many straightforward, honest people to stand on their own feet and do their own thing is frustrated: everybody has to become some sort of servant of a monster organization, a bureaucracy, to do anything. This makes a very poor life. So I have no doubt in my mind that at this level private enterprise is excellent.

You go to the other extreme if you have a huge factory, a huge company, whose every movement has a vast social and political impact. Then I think

private ownership is just a pretense; it has no existential reality, The "owner" has no relationship to these assets. It's much like the pre-revolutionary French landowners who were living in Paris and just drew an unearned income from the workers or from the peasants. So there one has to look for arrangements to remove this pre-tense. But to think only in terms of state ownership gets one into endless trouble. My own conclusion is that government and business do not properly mix, and they must be kept separate. But that doesn't mean that one can't bring the social interest in. In Britain there is a tradition of the public corporation, and the division of powers has been fairly well worked out. When the coal mines were nationalized, or the electricity industry, or the gas industry, or the railroads, they were organized as public corporations: just as much companies as Imperial Chemical Industries or General Electric. There are many precise constitutional problems, because for everything there has to be an authority of last resort. In the Scott Bader Company, it's a board of trustees. If you have a democracy, it's easy to get rid of a government, but somebody has to see to it that the new government is formed.

When it's easy to get rid of the top man, then somebody has to see that there is a succession. In Britain that is the function of the Queen; in the case of Germany, it's the function of the President, and so on. Equally with a nationalized industry: who is responsible for there being a top-level board of management? Sorry, I can't get away from hierarchies? In Britain it's a minister; for the fuel industry it's the Minister of Energy. He appoints the board, each person, separately. This is a big mistake. I don't mind if the minister appoints the chairman of the board; but then the chairman must be allowed to assemble his team. If the minister separately appoints the chairman, deputy chairmen, board members, that's not the way to build a team. And everything depends on teamwork. This is a flaw in the arrangement. There can be rules, provisions about the size of the board, and all that. Apart from this flaw, on the whole the arrangement is very sensible. The minister can appoint only the board; anything underneath the board, which are the chief executives on a vast thing like the British Coal Board--we had a payroll of 850,000 people at the start--is appointed by the board. I have never been on the board; I have been at the next level. I even could make a public speech against nuclear energy in 1967, which caused a fantastic furor and went up to the Prime Minister. But the government couldn't sack me; and since the board didn't sack me, I was protected. It's vital to have protection against this "spoils system," that anybody further down can be appointed by government.

The management problem, when the company is big, is absurdly great. Administration is really a very, very difficult job. In the coal industry in Britain we all wished we were mining engineers: that's an easy job, where you have to grapple with dead matter. But to grapple with living matter, that's much more difficult. You sit in an office and you have somehow to frame rules that fit reality. But reality is always even stranger than fiction. The style of management in a hierarchy should be the best possible style of management. If people don't consult, then it is just a bad style of management. At the Coal Board we always had excellent consultation, quite a way down, and all that. Well, administration is unbelievably difficult. It is really doing abstract justice to the concrete reality. If you now get your best brains up into the head office for administration, you are missing them down below, at the scene of action. It will be well administered, but the actual operations are done without first-class talent. And, if you get the first-class talent not at the top but down below, then it means you have second- and third-class talent administering, and the people down below are frustrated because of that so- and-so bureaucracy framing these stupid rules.

This has led me to the conviction that the best administration adheres to what I call the "negative theory of administration": Strive to find structures which need minimum administration. Very small structures administer themselves; there is no problem. It's not a matter of abstractly framing rules, because the human mind encompasses the whole thing and can make decisions ad hoc, and consultation of course is very easy.

When, however, you are landed with a big thing, what do you do? I had two pictures in my mind: one the picture of a Christmas tree, with a star at the top and all sorts of nuts underneath, more or less nourishing and useful nuts. That is a monolithic organization. The administrators, as particularly epitomized by accountants, always tend to such an orderly setup. The biggest task in any living thing is initiative. But, with this monolithic structure, one normally looks to the star at the top for the initiative because all the rest are executors of the policy. One man's initiative, no matter how able, and then a diminishing scale downwards of initiative is just not good enough to keep the thing alive.

Take the other picture--a chap at a fun fair, who in one hand holds hundreds of strings, and at the end of each string a balloon. Each balloon has its own buoyancy, a nice round thing. That is the ideal structure in a large

organization. Of course you need someone to hold it all together, but it is not a star at the top, it is a man underneath and each balloon has its own buoyancy. Each balloon is somehow a limited thing, and thus, in a manner of speaking, the more the merrier.

So with this idea we thought, How can we reorganize or structurize this monolith~ Simply to decentralize it and break it up was not an option, for quite insuperable reasons. First you want to reduce the total mass, and find out what are activities that could be separated out without paralyzing things. There are many activities that might just as well be done by outside firms. For example, the Coal Board had its own printing shops; well, printing and coal getting have very little in common. So let's take those activities out and organize them under a separate executive, which still is part of the whole thing but has its own identity.

In the historical process the first thing to be separated out was open-cast mining, what you call strip mining, which is something quite different from deep mining. This was taken out because the chap in charge of an area that does deep mining is not terribly interested in open-cast mining, nor does he have the expertise. That was the first executive, the open-cast executive.

Then, after the coal has come up the shaft, sometimes it is sold as it is, to power stations and so on, and sometimes it is processed, through coke ovens or other plants. And we found that this too is something quite different, which requires expert management and special expertise and all that, and which lends itself to being pulled out of the big mass. So we got the coal-products executive. And a few other things: we were landed with a lot of brickworks attached to the coal mines. The mine manager is not necessarily a very able brickworks manager, so that became the brickworks executive.

Then there are other activities, such as motor transport. The Coal Board was one of the biggest motor- transport undertakings. It takes certain management skills to do this well: buying, maintenance, repairing. It wants to be organized if you have between five and ten thousand enormous lorries, not only to cart the coal around but also to dump the shale, dispose of it. Then the interesting things begin to appear, because you think, Well, all vehicles are to be put under a separate transport executive. Ah? Does that really make sense? Should that include the fire-fighting engines? Should that include the ambulances, You have to make distinctions. I insist that all this is hard work; there are no set formulas.

We are then left with a big mass of coal-getting proper. We divided this into seventeen areas, and then started sorting out which functions can be absolutely at the discretion of the area director. There the principle of "subsidiarity" comes in; that is, at headquarters we do not want to do anything that in fact they can do themselves. Only when they need help do we arrogate to ourselves this particular function. The functions that could not be decentralized or delegated downward were, for instance, negotiations with the union, overall financial arrangements, and certain parts of marketing policy .

Of course, a change in the system doesn't solve the problem. Gandhi once said scathingly, Everybody is looking for a system so perfect that no one inside has to be good. Such a system doesn't exist. Any organization has people in it, and the people are much the same people as are outside. All the same, if one changes the basis of ownership, it does open a door through which one can walk and do things that otherwise would be done in a sort of benevolent, patriotic spirit. And then it becomes the challenge, the natural thing to do. While a private firm can have a very good tone of management, with plenty of consultation, once you've changed the ownership pattern, then this becomes a constitutional duty. It's not left to the free will of the owner: you've got to do it, sometimes even if it doesn't immediately pay to do so. And the whole thing assumes that, perhaps idealizing it a little bit, the quality of people is there--a function which business does not normally fulfill. After all, people spend most of their energy on the job. Business is not there simply to produce goods, it also produces people, so that the whole thing becomes a learning process.

Rash nationalization, without being very, very carefully thought through, is almost invariably a disaster. Like any deep disturbance of a living thing, the very abruptness of change causes so much turmoil that it takes years to get straight again, and then finally to make use of the opportunity, to make it a change in the right direction.

There were three main activities which accrued to me at the same time that I had a full-time job as chief economist of the British Coal Board. All three are spare-time activities. (In Britain it's so difficult to raise money that anyone who says, First the money, and then we'll try to do something with the money, has very little chance of succeeding. I believe the best things have grown from people who said, Of course, I make my living, but there's

plenty of time to do something else as well. The main thing is not to have to sponge off society.) These three activities are, first of all, the Soil Association, which is a private British organization to try to develop organic farming. We've been at it for the last thirty years. Of course, we have been ridiculed; but the wind is blowing in this direction, and we don't really know how to cope with it. We are overrun with people who want now to farm organically, but of course for generations no farm manager had been trained. We get land offered, but we have to go through the motions of training people first. We have infiltrated a number of academic institutions and are running the training with established institutions, which of course is much easier than to build something up entirely de novo.

I am not impressed by the big power structures. As power structures they are of course dangerous. But they do happen to be run by people, individuals. The time has come to work with the dinosaurs, the large corporations.

My son always takes initiatives. He wrote a letter the other day to the British chairman of General Electric, Sir Arnold Weinstock. No doubt he picked up some- thing at home, but it was his letter. He wrote,

Dear Sir Arnold Weinstock:

In view of the fuel crisis, which will not go away, and in view of inflation, which also will not go away, and in view of so many old and lonely people, why don't you produce an electric mini-teakettle? It seems silly that these old and lonely people should heat up two or three pints of water just to make one cup of tea. If you would do that, you would: (a) help to solve the fuel crisis; (b) help to fight inflation; (c) help these old and lonely people; (d) give us a good idea of what to give them for Christmas or birthday and (e) make a packet yourself. If you would take up this idea, you might consider sending me enough money to buy a bicycle, also to save fuel; and, once you have produced it, a mini-teakettle for my old dad. I might consider

He signed himself "Robert Schumacher, age 11."

Well, the dinosaur replied within two days, on exquisite notepaper, typed by the most wonderful electric typewriter:

Dear Mr. Schumacher:

General Electric actually do not make small stuff, only very big stuff. But I must thank you for your most Interesting letter. If you carry on with that amount of initiative, you will soon earn enough money to buy yourself a bicycle and also to support your old dad.

Yours sincerely,

Arnold Weinstock.

Well, forgive me: this just came up. It is a memory. You see how one must deal with dinosaurs.

So the first organization I am involved with is the Soil Association. Our task currently is threefold. First of all, to organize the training for organic farmers. Second, we have set up a marketing company to market organic produce. In order to do this we had to invent an emblem, a trademark, so to speak, which we have registered with the authorities, who will not register a trademark saying, "This is organic produce," unless we are able to assure them that we can monitor it. It has been a lot of work to find out a method of monitoring. You can't monitor everything that comes off the farms, but you can monitor the soil. A German fellow has developed a very ingenious soil test, which we got accepted. That's a feasible proposition.

That's the marketing company, which can get the premium that organic produce deserves, because the value per ton or hundredweight of organic produce, even in scientific terms, is higher. The third thing is, we have now organized an organic farmers' cooperative. So that they can maintain their full independence They don't pool their farms, but it is a service cooperative, so that they can do some joint buying and other joint services. Now these things are going ahead, and the cooperative is helping the farmers to bring back into their hands more of the value added. For instance, if you have organically grown wheat, and you're not too far away from a market, why sell the wheat~ Why not sell freshly ground flour? For this we have been able to find excellent small-scale milling equipment, and per pound of flour the farmers get twice the revenue they got per pound of wheat. So that value added is brought back into the farm economy, rather than being skimmed off by the miller. And of course the flour better, freshly ground is better, organically grown is better, and it commands a better price: the value is higher.

The second link of my little chain is this company called Scott Bader, a plastics company founded by Ernest Bader, a Swiss Quaker immigrant to England before the First World War. He's now about eighty-five. Ernest Bader was penniless when he started in England. He said, All my life I will have to work for others. What a dreadful system. Well, it didn't work out like that. He was an entrepreneur and he had a business and in 1951 he suddenly woke up and said, I am now doing to all these people what I suffered from when it was done to me. I am not going to go out of this life with this feeling. No, I must do something. So he got in touch with various people, including myself, and said, I want to put this on a basis that I as a Quaker and a pacifist believe in. I don't believe in what I am doing. And so we worked very hard and hammered out a constitution for this firm. Ernest Bader said, No, I don't want to have ownership of this company, and so all the capital, except 10 percent, was vested in the commonwealth, which was set up for this purpose as a limited company. The equity doesn't lie anymore with Ernest Bader, it lies with that commonwealth, and everybody who works for a certain length of time becomes a member of the commonwealth. Legally speaking, the commonwealth is the owner of the operating company. At first the family retained 10 percent founder's share, so arranged that they had a majority, not with the intention of using it but as a last resort. Because it is jolly difficult to build something up but it is very easy to ruin it.

We then tried to learn the business. What does participation mean~ Can you run the thing so that you actually give people the "absolute" security that if trade is bad we won't suddenly draw a line and say to you, "Out," in order to protect our livelihood? No, this is a livelihood, this is a community, a solidarity. How can it be done:' That is the question. Everybody told us it couldn't be done. What do you do if suddenly trade slumps, and your competitors lay off 50 percent of their work force and you have to carry the whole thing? Well, there's no use reading books about these things; one has to feel them on one's own skin. It leads to quite a different kind of management. The demands on management are greater.

We have to think ten times before we expand at the start, because we know once they are with us we belong together. In this sense there are no owners and employees; we are all co-owners and co-employees. It was not until 1963, that is, twelve years later, that we felt it worked. The founder's shares were also put into the general pocket of the commonwealth, so it is

the administration of the commonwealth that owns the thing. In fact you might say ownership has been abolished. It has not been transferred to any individuals. Because a member of the commonwealth, when he wants to leave, move to another part of the country, or doesn't like it anymore, does not take with him a slice of Scott Bader. Instead of all the rights of ownership and all those different rights simply being with the owner, we now have to ask, What happens with the money? What happens with the management? In free personal capitalism everything is automatically "mine," it all rests with me as the owner and this makes a lot of sense if I am a working owner. But we now have to think it out and distribute it and we learn a great deal. Participation, of course, is a hallowed word and we all approve of it, and say, Well, you know, democratization. . What precisely does it mean? People say, Well, we don't want a hierarchical structure. Well, can you run the thing without some hierarchy?

These questions have now been practiced in reality in the Scott Bader case for twenty-seven years. And one can only use the famous phrase "I have seen the future and it works." The company has gone from strength to strength.

We imposed upon ourselves a number of what I call "self-denying ordinances." One of them is, being of Quaker origin, we will not knowingly sell any of our products if we have reason to believe it will be used for armaments.

The second one is that a sort of parliament of workers is the sovereign body, not the board of directors. And they can, in fact, choose or dismiss directors, and have to approve the salaries of chairman and directors. In that respect, there's a high degree of democracy. Also, there are constitutional provisions for real participation in decision making.

Another one is that we have settled the maximum spread between the highest paid and the lowest paid: that is, before tax. It may shock many people that, in spite of a lot of good will from all concerned, that spread is still one to seven. There is no pressure from the community that it should be narrowed, because it is understood that this spread is necessary. But of course this includes everybody, the lowest-paid juvenile compared with the highest-paid senior employee.

The fourth self-denying ordinance is that we are determined not to grow beyond the size of four hundred. Now, you can ask, Four hundred~ Why not three hundred and fifty~ Just as in nature a cell doesn't expand and expand, but when there is a requirement of growth it splits and makes a new cell, so we have, under great pressures of growth, split and have put into being three new companies, totally independent. That requires a bit of brainwork, to determine where you can Separate it off. But the primary concern is to keep the human touch.

,The final ordinance is that when there are profits-- and there have always been profits--some money must be put aside for taxation and reinvestment. A maximum of 40 percent is available for distribution. But for every pound that we distribute to ourselves, we set one pound aside for some external noble purpose. So up to 40 percent of the profits can be distributed, half to our members and half for some good purpose outside.

The idea was that with this money we wanted to get involved with the requirements of the neighborhood. But within fifty miles, we couldn't find anything that needed doing. I mean in this little firm, only four hundred people, over the course of almost thirty years, everything that other regions are crying out for has been looked after. The old people are looked after: they get their regular parcels. The boys' club wanted a baseball diamond: they've got it. The association of the blind wanted help with their Braille: they've got it. The embarrassment now is that we can't find any new purpose in the neighborhood. This is very important: if the wealth is really utilized in the neighborhood it comes from, then actually all problems can be solved. The social problems anyway. So we have to go further afield, but just to hand it over to some national charity is witless: we don't want to do that. It's a big job.

Scott Bader is more than an experiment, it's a lifestyle. Yet, in our primary purpose, which had been the humanization of the work process, in all these years we've not made much headway. We are hooked there on a technology--as the English schoolchild says of the chemistry lesson, he says it "stinks," and a chemical factory stinks. And it is a process that cannot be humanized. We might one day say, Well, then, we won't make polyester; we will do something quite different.....But meantime, we thought, we can't humanize the thirty-eight hours a week that people work for their living, but what about the other more than a hundred hours a week that they're anyhow not in the laboratory, not in the office, not in the factory? There we found very

quickly that infinite boredom prevails, which leads people to look at television. And that doesn't make anybody happy.

We said, Surely the community can develop activities, useful activities, for utilizing their spare time. And there again, we started by suggesting, Why don't you build yourselves a community motorcar repair shop? You're all clever chaps with your hands and brains. Those who have a motorbike can be seen every weekend sitting surrounded by the parts of the motorbike, enjoying themselves hugely by pulling it to pieces and putting it together again. But with a car you can't do it, because the thing is too heavy: you don't have the gear. They then built themselves a community motorcar repair shop. We got two old-age pensioners to look after it; they're happy, they've got something to do, thank God. And when a car breaks down, they take the car to their own garage and repair it, and the cost is just the cost of materials. That is an extension of the whole idea of community.

The next thing is, every Englishman has a little garden, so we had a simple idea: really good gardening tools and machines. Little chaps, they buy a thing and find it doesn't really work; it's a flimsy job. So we got very good people to advise us, and created a gardening-machine pool, again run by a number of old-age pensioners, and everybody has access to really superlative tools and they've all become passionately interested in growing things, not just keeping their lawns shorn.

The next step has not yet been implemented. We have actually some land, but Ernest Bader-most unreasonably? --doesn't want this land to be used for vegetable production. He says, I live here, and this has been my parkland. The committee says, We are dying to grow vegetables, but we are not going to offend the old man. I mention this rather touching incident because it shows that the relationship between the worker and the boss, the accursed capitalist and the exploited workers, has entirely ceased. We would not do a thing which we all know is reasonable. We know the old chap is unreasonable in his high old age, but we would not offend him. We would rather wait. Now that's reasonable?

The next thing that is now in the planning stage is a commonwealth woodworking shop, because they say, We can make our own furniture; we can even go further and make a surplus of furniture for local sale. So we shall see. But on the basis of this little firm having been put on a common ownership basis, which of course seemed a most generous act on the part of

the owner, a new life-style is gradually developing, which may in fact take off the pressure on the need to earn wages, so that we could reduce the working hours, and perhaps we can leave it free to people to choose. But whether it is forty hours a week, or thirty-eight, it is still a full-time job, and if it's mindless work it has a very bad effect on the worker. I think if it were twenty hours it would be just a chore, for a few hours every day, and human nature can stand that.

The third organization I'm concerned with is one that I started with a handful of friends in 1965: the Intermediate Technology Development Group, Limited. In the U.S. you would call it "incorporated," but "limited" is a better word--it's more descriptive.

Now you have the company, charity status, no money, maybe somebody has let you share an office, but what actually do you want to do? You want to create and systematize this intermediate technology, but how do you set about doing this? All I can say at this early stage is, Beware of the planners. There are all sorts of impatient people who will say, You must have a five-year plan, a ten-year plan. Quite useless. You must realize your non knowledge, what you don't know. The inner attitude if you think you know is quite different from the attitude when you know you don't know. You're much more observant, more alert.

And it happened that we heard that a British trade mission was going to Nigeria, and we thought, My goodness, what are they going to flog in Nigeria? Certainly not the stuff the Nigerians really need. What if we made, very rapidly, a catalog of hand- and animal-propelled agricultural equipment obtainable in Britain? We had only a few weeks to do it, and under this pressure we found that our society is very highly organized. You have only to find out how to touch the network; the network already exists. There is an association of agricultural engineers, one of producers of agricultural equipment. We got in touch with all of them and produced a little catalog, stenciled, of animal- and man-operated agricultural equipment obtainable from little hole-and-corner firms in Britain.

When the mission went to Nigeria, they were most astonished. This thing was torn out of their hands by people who said, For the first time you bring us something that is of interest, instead of the usual glossy catalogs; and that gave us a clue as to what needed doing. We said, Of course this is a rough job; let's do a bigger job, not limited to agricultural equipment. And in

1967 we produced a big catalog, called Tools for Progress: a Guide to Small Scale Equipment for Rural Development. In 1967, after twenty years of aid, so called, which had involved many billions of dollars, this was the first time that somebody made a catalog of suitable equipment for developing countries, and it caused a sensation. Although we were operating out of one small room, and had no sales apparatus, this catalog rolled around the globe, It actually became a commercially profitable proposition; we borrowed money for it and we paid it off again.

In this catalog the manufacturer had to pay for having his product included; some things got in that we didn't want in, and some were left out. Also it was limited to Britain because we had no money to travel. So it was a superficial job and we found we had to dig deeper. We came to the decision that this had to be done systematically subject by subject as opportunity served, Now, if you want to do something effective, the first decision you have to make is, are you going to work in your own back yard, turning your back on big, rich society, or are you going to harness the society to do the work for you? We decided that the needs were far too urgent to go the comfortable way of puttering around in our own back yards; we must find the ways and means of roping in the big society. How do you do it? Well, there is a lot in the organization structure that needs to be observed. Let's have a structure like nature with little cells. To each cell we can attach people. If we have just one cell that grows bigger and bigger it's not flexible enough. And so we took up one subject after another and set up specialized panels: building, agricultural equipment, water, power, rural health cooperatives, etc. The first one was building. Let's organize this as if it were a separate little company and let's invite people from outside, on a voluntary basis, to give us their advice. We have plenty of people interested in this. Often they just approach us and say they want to do this kind of work. That's the way it happens.

The building panel was twelve people who had been invited to help us on the question of the poor man's building problem. Why in Africa do they have to have South African or European or American contractors to do the bigger jobs? What sort of people do we want on this building panel? There are three main forces in society, we call them A, B, and C. A are government people, administrators. We want them with us. How can we find in all this some sympathetic character who would like to join in the work? That's the A factor. But let's face it, government can't do anything, really. They can stop things, finance things, they know the ropes; but government is not a daring

center of initiative and creativity. So we need a B factor. B is business; after all, business is what does the work. And in business lies the know how and also lies the discipline of viability, how to make things so that you can pay your wages on Friday. We must have that particular element on our side. And C are the communicators, the people of the word. They don't actually produce anything like lettuce or bread, but they produce ideas and generally speaking (and I mean this in a very kindly way) they are very playful souls. They fall in love with the problem, they solve the problem, mark it top secret, and file it away, fall in love with the next problem.....It is of course a resource, but only a resource. If somebody has the organizing power to make these ideas work and put them into flesh, that's ABC. Now of course if the C factor has done some productive work, wants to file it away, then the B factor will say, We spent some money on it, we now must get it applied, push it out. The C factor doesn't want to do that; it would be soiling his hand by becoming commercial. Well, one has to make up one's mind. If one wants to maintain a sort of noncommercial virginity one cannot become really fertile. So each of the panels is composed of these three forces. When they come together they discover that the other two, of whom they have had a very low opinion, are quite good people, and they enjoy it. This is very effective.

To have voluntary people who come together to give sage advice is wonderful, but how is the work going to be done? We want to know, from the best information we can get, what needs doing. Among the building panel the thing was very interesting. I have always had very simple, stupid ideas. I have, perhaps, a bit of a gift to reduce things to their basic simplicity, and I ask questions like, What is a building anyhow? I come up with the answer: four posts with a roof. The posts are not the problem, the roof is. So I thought the building panel would advise us that we should make a proper study of roof construction, roof materials, suitable in poor countries, and the like. But they said something quite different. They said, No, the missing factor in the building field is not material, it is that architects, civil engineers, bricklayers, plumbers, etc., get trained, but the one man who is supposed to take the contract and hold the thing together has been forgotten. Even if you work out a new technology, there is no one to receive it except these architects, etc. You must begin at the beginning and that is the contractor.

Our purpose is not to get a lot of dogs and then do our own barking, and so when we got this advice we asked, What can we do about it? Well, you

have to train the contractors. Is this acceptable? Do they want to be trained? Well, let's discover what the situation is in Nigeria. Lo and behold we quickly find that actually the Nigerian contractors turned out to be extremely teachable, delightful people and several years' work was done to produce the teaching materials thoroughly tested for indigenous contractors. From Nigeria this thing has leaped to East Africa and elsewhere. We feel as far as that is concerned we have filled a knowledge gap. Out we don't want to become a specialized institution training contractors. No, now everybody can do it. This knowledge gap has been filled.

The building panel says, Now we can turn to building materials, particularly roofing. There my intuition was quite correct; they confirmed it. But how do you build a roof when you have no steel and no timber? How did our forefathers do it? They very often did it with vaulting. Now what is the applicability of that? What methods, etc.? There is bamboo in many places. Can this be used with real modern intelligence but still keeping it so simple that the little villager can build a really good roof? While traveling around the world, I've always asked the building authorities what materials they needed and they said corrugated iron, in another place aluminum, and in the next place it's something different. Nobody has done the work. It's all hit and miss. Our building panel is now working on roof-construction materials and methods and will soon come up with very interesting results showing that there are quite astonishing things that can be done with very simple materials.

This is ITDG's structure. But for a panel to be able to work we then attach to the panel a permanent officer who has to be paid. We don't always succeed. Each thing is organized as a separate project and has to be separately funded, and we don't always succeed in getting the funding and then we can't have a permanent chap, but we try to keep it going in some way. Normally our permanent staff member has the task of finding some agency where the work can be done. For instance, the agricultural-equipment panel says we must survey the whole world for really useful agricultural equipment, make sure it is verified, look at operating conditions, and then publish it, not with a vague description but with line drawings so that the village blacksmith, perhaps with a bit of help, can make it on the spot. Where do you do this work? It's not a work that you do in industry; it's a work that's done at some academic institution. So we infiltrated ourselves into the National College of Agricultural Engineering, which is situated in Bedfordshire. From there we created an international unit--of course they

have land, students, professors-- and we got prototypes of various equipment. We studied, and when we were thoroughly satisfied our booklet was published. This is now a series of publications which go into all countries, simple, down to earth, proven agricultural equipment,

The work of our unit encouraged the staff and students at the National College to start thinking the same way. One of the machines they developed is a "walking mini-tractor." It isn't terribly clever to send two tons of extremely expensive machinery called a tractor backward and forward over the field, compacting the soil and making life very troublesome for the soil bacteria; they can't breathe properly. And all this for the sake of pulling a curved knife, a plow. Wouldn't it be easier and better if we could just pull the plow without having to pull the whole weight of the tractor.

Now, a young engineer at the college--his name is Barney Muckle--recalled that our forefathers used semi-stationary engines in this way; but they never completed the method, and they didn't have the engines that we have today. So a team set to work to improve on the old method, and they came up with a machine they christened the Snail. It's not for fast plowing on a two-thousand-acre farm in the U.S. but that's not the problem in the developing countries. The problem is that the farms are three, five, seven acres, for which the tractor is a nuisance anyhow. This Snail has a fuel cost per acre which is 1/100 of tractor plowing. In fact, you can forget about fuel costs. It also has a capital cost of 1/100 of tractor cost. It really is a technology for the poor who ipso facto operate on a small scale. Again, I'm not saying it's the right thing everywhere, but it certainly increases the choice, because the little engine looks like a sewing machine. You can take it under your arm and walk away with it. Maybe in certain applications this is not the answer, but bullocks. This has to be weighed on the spot by the operators. The joy of reality is that the Snail doesn't have to be stabled, fed, except with a bit of oil, but of course it doesn't produce any muck. The bullock does. You have to weigh one against the other. You can't do that at a desk; you have to do it as a practical farmer. But now at least he has an engine that is so cheap he can afford it and fuel consumption is a minimum.

We have so many publications now that we have pulled all that out of the main organization and set up a separate company. Intermediate Technology Publications, Ltd., which is wholly owned by the charitable organization, but works with commercial discipline.

In Burma, before I was there, there was a British military station, about twenty or thirty miles away from a town, and in order to get the mail to the people the British authorities hired an Indian chap with a horse and a coach to bring the mail. They were prepared to pay him--not his entire costs because the coach was fitted to take passengers and the road from this military station to the town was a very busy road, lots and lots of people walking or oxcarts very slowly moving along. This Indian carried the mail back and forth for a year, and when the year was out he came back and said, I can't go on doing it at that price. Why not? Because I can't get any passengers. Why can't you get passengers? The coach is convenient, plenty of people, the price is perfectly reasonable and they all have money. Well then, finally someone--he had probably been to Harvard business school--said, Let's ask the consumer. They asked the consumers, these people who are walking twenty miles in the hot sun, Why don't you use the coach, it only costs a couple of rupees? They said, Look at the horses, the horses shouldn't be pulling a coach; they should be out on the grass. We would never demean ourselves to travel behind horses that are so ill kept. We'd rather walk.

Before we can publish we must be quite sure that the thing works. Not only works under the conditions of poor countries, but also it must have social acceptability. We are quite pleased about one development which our agricultural panel induced. So much mechanization of agriculture has been a total failure and we wondered why. Basically, simplifying it, it is because here we have someone who has an absolutely marvelous weeding machine or implement. So he says, That's what they need. Out he goes, he shows them this technical marvel, and they, of course, equally as enchanted by technology as we are, they say yes. Then you come again a year later and it's rusting somewhere. It is totally useless for them. So we want to make sure that the equipment is wanted. It is wanted when, with their current methods, they can't do the job properly because the workload is too great.

It is necessary to measure the workload through the first months of the work year. And you find the characteristic curve which has a peak when everyone is out in the fields and then it has troughs where everybody is sitting around with nothing to do. You may have several peaks. And then you say, Well, here at the peak they are overextended, and unless I break through I am not helping them. That's where we need some mechanical help. Down here, it may be a laborious chore, but so few people are involved, if I now bring in capital goods to reduce the labor, I merely increase the items

and reduce the cash resources in the village. I am not doing them any good whatsoever. All this has been reduced to a very simple method so that we don't need studied people to do the assessment; we get school leavers to do it. We will not talk about mechanization of agriculture in general but only for specific localities after this ascertainment has taken-place. Then you don't have any problem of the peasants accepting it because they know perfectly well what is right and what is wrong. If they are not seduced by aid, if they have to pay for it themselves, they are very shrewd. And of course they have to pay for all the things themselves because we have no money.

Many of the technologies that we have so far developed are meant to be capital saving. They are capital saving, so they are in reach of the poor, but many of them are too labor intensive; they are too much work. We always look for improvements. We never talk about this labor-intensive technology as being desirable, because slogging away is nothing particularly desirable.

In order to have intimate contact with industry we have a unit called Intermediate Technology Industrial Services. This is now financed by the Ministry of Overseas Development. They find that they can't act effectively unless they work intimately with industry, but for government to work with industry is extremely difficult because there are rules. The industrialists think, Oh, here is the big purse, now maybe we can get big money there. It's very difficult for government. So government works with us, the industrialist works in his own unit, and we work with industry. We are, as it were, the differential between those two wheels which go at different speeds.

Two more points. We want to help the poor but in the poor countries not everybody is poor. Some poor countries have far more money than is good for them, like the OPEC countries. Why should we do charitable work for the OPEC countries? If they want me to go there, I take off my charitable hat and put on my commercial hat of another company, which is Intermediate Technology Services, Ltd., a purely commercial company, and I recycle the petrodollars. This helps to finance the charitable work we are doing.

The final problem is to reach the people for whom we are working in the third world. How do you reach two million villagers? There is no ready answer. We try to persuade the developing countries to set up a counterpart organization in their own country. Let's take Sri Lanka, the last country I

visited a few months ago. If you have such an intermediate technology organization in Colombo you have a better chance of getting in touch with the little people in Sri Lanka than if you have it in London. Ideally I would want to deal only with these counterpart groups around the world and create a network, quite a number of these groups have been set up. They're not ours; they're theirs. They are purely indigenous. Some are more successful than others. I think the most successful ones, which go quite a few years back, are in Ghana and India. They are really standing on their own two feet, and if anybody wants our help in Ghana or India we can immediately say, Well, first go to the Technology Consulting Centre at Kumasi in Ghana, or the Appropriate Technology Development Association in Lucknow, India. And if they need help from us they will find a way. It must become a network, otherwise it is unmanageable.

This applies also to the rich countries. Actually, and not so surprisingly, the rich countries are now waking up to their own problems, namely, that the rural areas are being drained of people, that there has to be a redevelopment that we thought hitherto was necessary only for the third world. So in a number of them intermediate technology groups for local use have come into being.

To summarize, ITDG's activities are based on five convictions:

The source and center of world poverty lies primarily in the rural areas of poor countries, which tend to be bypassed by aid and development as currently practiced.

The rural areas will continue to be bypassed and unemployment as well as the drift of migration into cities will continue to grow unless efficient, small-scale technologies are made available with assistance in their use.

The donor countries and agencies do not at present possess the necessary organized knowledge of adapted, appropriate technologies and communications to be able to assist effectively in rural development on the scale required.

In matters of development there is a problem of choosing the right "level of technology" to fit the given circumstances; in other words, there is a choice of technology and it cannot be assumed that the level of technology

used by affluent societies is the only possible level, let alone that it is necessarily the best for poor societies.

The technologies most likely to be appropriate for development in conditions of poverty would be in a sense "intermediate" between--to speak symbolically --the hoe and the tractor, or the panga and the combine harvester.

Know how at this intermediate level, and the relevant equipment, obviously existed in many places, but no one could say what gaps there were, and there was no point anywhere in the world where this know how could be obtained as and when the people most in need of it required it. Intermediate Technology Development means the work of bringing this kind of knowledge to light, systematizing and, where necessary, completing it, and organizing a world-wide system of "knowledge centers" where it can be readily found.

Ten years of work in this field have supplied the Group with plentiful evidence that the "knowledge gap" it set out to fill is indeed very wide. Technologies applicable on a small scale by or in communities with plenty of labor and little capital, lacking technical and organizational sophistication, are on the whole poorly documented, difficult to get hold of, and in many cases even nonexistent. There are numerous instances where the relevant knowledge and equipment used to exist but have virtually disappeared, in accordance with the well-known tendency of the "better" to be the enemy of the "good." This tendency is of course progressive and therefore to be welcomed, unless it deprives large numbers of people who cannot afford the "better" of the "good" they could afford.

4. On Appropriate Forms of Ownership and Action

The party's over and we have now to see what happens after the party. I'm not saying this is the end of the world, but certain structures, certain ways of life, have been created during these last roughly hundred years based on cheap and plentiful fossil fuels and based on a few other things. What other things? I will say, We had this party. Some of us enjoyed it. We were entertained by three great magicians, illusionists. One was the illusion that somehow, against all laws of nature, infinite growth in a finite environment

is possible. That illusion of course has been attacked by many people for quite a long time. But it was then exploded by The Limits to Growth report. Now mankind listens because one could say that the computer has spoken, not just the human voice.

The second entertainer said that by some strange law of nature there is an unlimited supply of people who are prepared to do mindless repetitive work for quite modest remuneration. The same sort of illusion that was fostered in slave-owning societies about the slaves. Now people are waking up and discovering their power, discovering that without them the party would never have happened, that they are actually needed--much more than I. And this means a fundamental shift in power, which is not the same in every country. Some countries are ahead in this development and some are lagging behind. We have to rethink the whole industrial system.

The third illusion, which is still rampant, is that science can solve all problems. I have no doubt that science can solve any individual problem when it's clearly defined. But my experience is that as it solves problem A it creates a whole host of new problems. It's quite a thought that there are more scientists alive today than there have been in all previous human history taken together. What do they all do? They solve problems very efficiently. Aren't we running out of problems? No. We have more and more. This seems to be a bottomless pit. They grow faster than we solve them. So this is where we have to ask, 'What on earth is going on here?' At the height of success, with technological competence unequalled in all human history, we read nothing but questions of survival. What did our forefathers do? They survived, obviously, without all these scientists. And without all these problems. So we have to ask ourselves if something has gone wrong in the development of technology, that finest thing we've got for our material life. These entertainers turn out to be illusions, but we still talk to each other as if these entertainers would return. They won't. They can't. Because of plentiful fossil fuel and a plentiful supply of labor prepared to be pushed around and put on assembly belts and so on, we have created a particular technology.

This technology is very unkind to living nature all around us. Living nature can take many knocks, it is tolerant. It has tolerance margins. But the massive assaults, even if only in a few places, lead to great ecological problems. This technology is also very selective in terms of the raw materials it requires, particularly the fuels. We could quarrel about exactly when, but there is no doubt that either sooner or later, and I think rather

sooner than later, we shall have to learn to utilize much less of the fossil fuels, capital fuels as I call them, and much more of the income fuels. But the income fuels come in very small parcels and cannot be used by massive overlarge technology, technology that depends on an enormous concentration of fuel. So all these different problems are very closely connected with this technological development, which was logical in its own way, but ceases now to be logical, and we have somehow to find a way out of this inheritance of the last hundred years.

What can we do? We should attend to the problems that we can attend to. I remember a conversation between an elderly lady and a young lady. The young lady said, I am about to be married. You've been married for a long time, how do you ever manage to agree with your husband? The older lady replied, It's really very easy, I deal with the unimportant things and he deals with the important things. And so the young lady said, Give me some examples. Well, how we spend our income, of course I deal with that, and which school the children are going to, and whether we should move and where we live. Then the young one said, What on earth does your husband deal with? Well, with the big problems: whether China should be a member of the United Nations and how to reform the government in Washington. This is the modus operandi, we are always in danger of becoming too clever about these things and not noticing what we in fact can do and the act of doing will keep us cheerful. It is quite amazing how much theory one can do without when one starts real work.

We must do what we conceive to be the right thing and not bother our heads or burden our souls with whether we're going to be successful. Because if we don't do the right thing, we'll be doing the wrong thing and we'll be just part of the disease and not a part of the cure. My only business, the only real job we have, is to look after, to the best of our ability, the little people who can't help themselves. If education and the advantages that we have had from society are only so that we might form a sort of trade union of the privileged, then our soul is so burdened with darkness that life is not worth living. The requirements of these little people who can't help themselves are very simple. They don't have to go to the stars; they just want to know where tomorrow's meal is coming from. They want to have housing, they want to have clothing, they want to have a little culture. And if, as a society, we turn over some of our resources to the study of these humble requirements, then I think the road is free.

You can't be alive today without being interested in China, because it's the biggest transformation that's happened in the twentieth century. This enormous country, sick unto death for so many decades, suddenly, in one generation, turns itself around. People are fed, cheerful, everybody's at work, enthusiastic, they're all drably but adequately clothed, children are in fantastically good shape, full of buoyancy and cheerfulness. If you compare that with China in the 1920s and 1930s, it's a miraculous transformation. It's still a very, very poor society. But it's a poor society where the basic requirements are being met.

Various things have happened. Virtually from the demise of the Manchus in 1911 until Mao in 1948-49 were years of the most intense suffering. Out of this suffering there were born some people, undoubtedly of quite extraordinary intellectual power and stature, such as Mao and Chou En-lai, and they have built a new society there. As an economist, I would say what they have done primarily is to turn economics the other way around. Our type of economics says, You mustn't do anything, mustn't produce anything, unless you are quite sure you couldn't possibly buy it cheaper from outside. When I was in Puerto Rico, a luscious island, I found that the carrots were imported from Texas? You mustn't produce carrots in Puerto Rico if the Texas-produced carrots are cheaper. That's our system. The Chinese have turned this around. They have said, You mustn't buy anything from outside unless you can be quite sure you can't make it yourself. It's as simple as that. When you say, You mustn't produce unless you are quite sure you couldn't buy it more cheaply, then development is impeded. On the other hand, when you say you mustn't buy it unless it is really impossible for you to make it, economically speaking everybody is challenged, everybody is busy.

Another very important idea that the Chinese have worked out is that it takes thirty peasant work-years to keep a young person at a university for one year. If a person has been at a university for five years, by the time he is finished he has consumed 150 peasant work-years. And so that old brute Mao said, Well, young person, what are the peasants going to get for this? After all, it's a big peasant society; you have been educated at the cost of the peasants. You have consumed 150 peasant work-years. Instead of going to a fashionable district in Shanghai, you will go to a remote village and give something back to the peasants out of what you have learned. They went there, and they found they had nothing to give them; all that they had learned was totally irrelevant. They couldn't even weigh babies without a baby scale that cost far more than the whole income of the village. They came back and

said, We don't learn at universities anything that is of any use. (This has a magical effect on the curriculum.)

Then they came to the next step and said, We must work and study together. Walk on both feet: a typical Chinese concept. A little period of study, then a little period of work. No one is too precious to do actual work, physical work. We must expose everybody to the reality of things. If they don't work, they don't know anything about reality; they know only what's written in books. They have everywhere insisted that people should have a small-scale technology and experience.

This transformation of China has been based on the idea of learning by doing. Not in the narrow sort of extreme-left sense, that only the workers, they know, but in accordance with Mao's teaching, namely that the manager or the intellectual has to go and learn from the workers. He then has to take back into his study what he has learned, make a theory out of it, and go and teach the workers That is the proper process. If the process is only half of that, either learning only from the workers or learning only from the managers, the theory is likely to be worthless.

ITDG has been under increasing criticism that we devote all our humble efforts to the third world and the rest of the world says to us, "What about us? We need an intermediate technology--an efficient technology." One province of Canada said, "We hear that you are dealing with intermediate technology for rural areas, but look what's becoming of the province. We are a colony of Toronto. We have been reduced to monoculture: wheat, wheat, wheat, nothing but wheat. Life is becoming intolerably dull. The things that we used to make ourselves now come in cellophane packages from Toronto. All the young people are leaving," they said. "The average age of the rural population of Saskatchewan is sixty-six years. We are a dying society? We don't want to die. We don't want the young people to leave, and they don't want to leave and crowd together in Toronto. But there is nothing else but wheat. So your intermediate technology, couldn't it help us?"

It was lunchtime and they served me some bread. I looked at this surrogate bread (already sliced) and I said, "Where does this come from? " "Toronto." "And the wheat in the bread? " "Oh, maybe that comes from Saskatchewan." "And why, please, don't you make your bread in Saskatchewan? " "Oh, in this day and age, surely that would be entirely

uneconomic? " The reply was obvious: "Make up your minds whether you want to die economically or survive uneconomically."

If they put only a small part of their intelligence in the direction of systematically developing a small-scale technology that would fit their area, then they could even live economically, instead of only dying uneconomically. But this is not always easy to sell to people, the majority of whom cannot imagine anything except what they have in front of their eyes. They say, Our whole life experience is just the opposite; now you come with this sort of crazy notion.

We had very interesting negotiations with the brick industry in Britain. A hundred years ago the brickworks would produce ten thousand bricks a week. Around fifty years ago, a hundred thousand, about ten years ago, a million. And now two or three million. What does this mean? It means enormous units, and either they are near the biggest markets or require enormous commitment to transport. With the increased cost of transport, of oil, of labor, it costs as much to ship a brick two hundred miles overland as to make it. Therefore, a big brickworks with a market scattered all over the country is economic nonsense. But this economic nonsense doesn't correct itself until somebody creates the efficient mini-brickworks. We are in a phase where nobody believes this is possible, and therefore, bricks simply become more expensive. The situation doesn't correct itself. Our task is to persuade our friends in big industry to make these design studies, and we have got a long way in our work, primarily for the developing countries. At the same time our brick expert builds a very big brickworks in England near Bristol, where there is a very big market--and a mini-brickworks in Ghana.

People talk about paper recycling, but do they really think about it properly? Here is a huge paper mill or a huge printing office--let's say the New York Times-- and the paper is scattered all over the country. Are you going to collect it all and bring it back to one point? That would be foolish. It can't possibly pay. it would be too demanding on transport. Once it's scattered, it can be recycled only on a small scale. Talking about this not so very long ago, I was approached afterward by a chap from the biggest paper producers in Britain. He was interested and asked if we were really working on this. Yes, I told him, we are desperately keen to get a mini paper-recycling plant. We know there are big ones; but the big ones fit only into the biggest conurbations, the biggest megalopolises. So he said, Well, of course, it can be done on a small scale. We've never thought about it. But we

have a little research tool--a mini-plant. Why don't you come and see us? We went to see them, and to cut a long story short they said, You're right. This is the wave of the future. You can have all our research resources to perfect this plant. And the design studies have now been completed. It doesn't cost us any money because they have seen what is really coming.

Now then, one asks oneself, They're so generous; in business one hand washes the other. What is their advantage in giving us all these facilities? If they're perfectly frank they say, The way we have grown up, the way we are constituted, we could deal with one five-million-pound plant in a certain stretch of time; but if it's a hundred little contracts that is not what we could cope with. So we are delighted that you are pioneering this because, when it's ready, then perhaps it will be our lifeboat.

I was invited to visit a very large farm in southern England. The owner had been a member of the Soil Association. He's been a member from the start in 1947, but his farm was run along entirely different lines-- highly chemicalized and so on. He was a deeply worried man when he showed me how dependent he had become on the industrial system, and if anything really went wrong, then the farm would collapse. He was unhappy. And as we were going across the farm--it was so big we were driving across in a Land-Rover--he stopped the car and said, "Do you see that land over there? There's two hundred acres just coming up for sale. I think I'll buy them. It would nicely round off the property." And I asked, "How are you going to farm it? " "Well, the same way as the other two thousand acres." "Why do you do it? You're worried because you don't believe you have the right system. Why don't you use this as your lifeboat? Learn an alternative system. You can't learn it from books; you have to do it? " He said, "You're absolutely right? That's what we ought to do. But actually I am not the owner, this is owned by a company, and whether my fellow directors will agree I very much doubt." It took him six months, and I got a letter. He was very happy that his corps of directors now agreed. They are running a lifeboat farm, trying the opposite methods, the organic methods, not dependent on the big industrial system. And it turned out that his fellow directors were his son and his nephew. There was harmony in the family.

It's very interesting to learn where the support comes from and where the opposition comes from. Support comes normally from people in big business. Apparently they have been rubbing against reality all their lives so they can understand these things. But, strange to say, the intellectuals, who

ought to be the most wide awake, get flustered. They get annoyed. They ask strange questions. They say, Well, even if you are right, once you have introduced intermediate technology, how can you make sure it doesn't become big technology once again? Questions that are, as it were, tangents going into empty space. Or they say, This is all very good, but in fact, you can't do anything because the system will not allow it. Or they try to involve me in discussions of whether I am in favor of growth or against growth. This attitude worries me. We need the open-mindedness and realism and toughness of those in big business--we need it to help us. But we also need the intellectuals, people of the word, communicators, research people, and of course those in governments.

The interest now is most lively in some of the advanced countries. For instance, in Britain, the biggest county is Yorkshire. And a number of Yorkshiremen said, Why don't you work with us for Yorkshire' I said, Because we are working for the third world, and that is what we want to do. But you're quite right, why don't you set up an intermediate technology in Yorkshire? At first it sounded strange to them, but the Yorkshireman--who considers himself the backbone of Britain--said yes. Unemployment is rising. Budgetary allocations from central government are falling. Why don't we do it' Why don't we stand on our own little feet, and put our own chaps to work? Of course we can't put them to work the way big society has done hitherto, because they are unemployed. And a workplace with a capitalization of \$50,000--we haven't got that kind of money from the big system. But we can develop and deploy an intermediate technology where you can become productive with very little capital. I can show you again and again that with very little capital you can get productivity that is higher than the chap's with a lot of capital. I'm not talking about moon shots; I'm not talking about aircraft; I'm talking about the basic things of human life--like building materials, cement.

Yes, cement. Can't we have a mini-plant for cement? What's the point of making it all in one place and then carting it all over the countryside' The developing countries, the rural areas, the peripheral areas of the rich countries are crying out for it. But it turns out that no, you cannot have mini-plants because people have got it in their heads that there's only one kind of cement--Portland cement--and that it can be made efficiently only on a large scale. The precise process of how Portland cement is made is not theoretically understood. Maybe we can learn more about it and then we can build the mini-plant. But in this search we might ask the question, Why

does it have to be Portland cement? Go around Europe, go to Asia, and you'll find the most magnificent, wonderful buildings. The Taj Mahal or the cathedrals of Europe were not made with Portland cement, and they are still standing. Why have we fixed ourselves on Portland cement? Maybe we need Portland cement to build skyscrapers but that is a minority phenomenon. Most buildings are not skyscrapers. What about other cementitious materials? It turns out there are plenty of other materials that can be made into mortar at half the temperature of Portland cement. And for most normal human requirements it is totally adequate and can be made on a small scale. There are similar examples in many different subjects.

But back to Yorkshire. The Yorkshiremen say, Well, we want to participate in this new knowledge. We want to see all these new possibilities. Can we work with you? Never mind whether you work for the developing countries or for England, because of course if we could have small-scale cement and human-scale bricks with very little capital, perhaps even with unconventional sources of energy, because it's on a small scale we can put our unemployed to work and we can look after ourselves. This has also spread to Europe. it has already happened--still very small, and very beautiful--in the United States. Of course, the United States is so huge that there is room for growing points all over the place. What is happening the world over is that on this level of technology, this type of thinking, there are very many lonely plowmen. But that is happening is that the network is gradually coming into being. So that we can share experience, there are now around the world about twenty such groups and they are full of enthusiastic people who have shed their prejudices and see that adjustment to the new situation is not only desirable, it is possible. It is not only possible, but it is in fact quite low cost.

I will end with an example from my recent experience. I know the original inventor of chipboard. He is German and his name is Max Himmelheber, which means "heaven lifter." Max is a delightful man; now that he is in his seventies, with no offspring, he says, This much I need for myself, that I don't need. He set up the Himmelheber Foundation and then came to me wanting my ideas about what to do with the money. He thought in real terms and he was very worried: he listened to my prognosis about fuel supplies and he then wanted to give all his money to set up an institute, as if we need yet another institute. Well, they should study everything, how can things be done by the chaps themselves without vast capital? But, I said, if you try to study everything you study nothing. Start from where you are. You are a

wood expert and the kind of chipboard plants you are building all over the world are monsters with an average capacity of one thousand tons a day and a capital cost that is out of this world. There is no future for that. What we need is a mini chipboard plant. Local production from local resources for local use. Why don't you design it? You're the best man to do it. And suddenly he saw something. He understood it. Like scales falling off his eyes. Yes, he said, I can see it, Tiny ones all over the place. Great fun. No problem of management. A man and a boy. Like egg trays.

So he went to his engineering bureau and he said, I want a design study for a mini chipboard plant. They thought he was off his head. I started at the extreme end; I said, Why not one ton a day? Well, one ton a day didn't quite work but 6 1/2 tons a day did. The thing nearly failed; they told me with authority and knowledge that it couldn't be done. The verdict was, You don't understand anything about making chipboard, now pipe down. I listened very carefully. At the end of it you have to have a whopper press in order to re-compound the fiber. And with one ton a day, or small production, you could never amortize the press--and then, thank God, they added, required to make the standard-size board. I heard that. I said, What size board? Well, the standard size, eight feet. So I said, What size can you make? And now we have a design study by these absolutely top experts, not the standard-size board but a board good enough for any man purposes.

All these small ventures may not have much weight at present but they are making a viable future visible in the present.

5. Education for Good Work

It is possible to discuss meaningfully the subject of good work (or education for it) only by first clarifying the questions What is man? Where does he come from? What is the purpose of his life?

I know, of course, that such questions are called "pre-scientific": There is nothing like them in modern physics and most of biology, says the modern scientist, and he is quite right. Maybe he thinks the question What is man? should be answered: Nothing but physics and biology. If this were true there would be no point in discussing "education." If the question "What is man~" is called pre-scientific, this can mean only that science is not of essential

importance for the conduct of human life: good answers to pre-scientific questions are infinitely more important.

What can be the meaning of "education" or of "good work" when nothing counts except that which can be precisely stated, measured, counted, or weighed? Neither mathematics nor geometry, neither physics nor chemistry can entertain qualitative notions like good or bad, higher or lower. They can entertain only quantitative notions of more or less. It is easy, therefore, to distinguish between less education and more education, and between less work and more work, but a qualitative evaluation of education or of work . . ., How could that be possible~ This, we are told, would be purely subjective; it could not be proved; it would be anybody's guess since it cannot be measured and thus be made objective.

The Cartesian Revolution has removed the vertical dimension from our "map of knowledge"; only the horizontal dimensions are left. To proceed in this flatland, science provides excellent guidance: it can do everything except lead us out of the dark wood of a meaningless, purposeless, "accidental" existence. Modern science answers the question What is man? with such inspiring phrases as "a cosmic accident" or "a rather unsuccessful product of mindless evolution or natural selection" or "a naked ape," and it is not surprising that it has no answer to the question of what this absurd, accidental product of mindless forces is supposed to do with itself, that is to say; what it should do with its mind. (Modern science has much to say about what to do with the body of the unfortunate being: "Survive as best you can?")

What, in these circumstances, can be the purpose of educational In our own Western civilization--as in all other great civilizations--purpose used to be to lead people out of the dark wood of meaninglessness, purposelessness, drift, and indulgence, up a mountain where there can be gained the truth that makes you free. This was the traditional wisdom of all peoples in all parts of the world. We modern people, who reject traditional wisdom and deny the existence of the vertical dimension of the spirit, like our forefathers desire nothing more than somehow to be able to rise above the humdrum state of our present life. We hope to do so by growing rich, moving around at ever-increasing speed, traveling to the moon and into space; but whatever we do in these respects, we cannot rise above our own humdrum, petty, egotistical selves. Education may help us to become richer quicker and to travel further faster, but everything remains as meaningless as before. As long as we

remain entrapped in the metaphysics represented by the Cartesian Revolution, education can be nothing but a training which, we hope, may enable people to establish themselves more comfortably--the body, not the soul? --in the dark wood of meaningless existence.

In other words, as long as we persist in our arrogance, which dismisses the entirety of traditional wisdom as "pre-scientific" and therefore not to be taken seriously, fit only for the museum, there is no basis for any education other than training for worldly success. Education for good work is quite impossible; how could we possibly distinguish good work from bad work if human life on earth has no meaning or purpose? The word "good" presupposes an aim; good for what? Good for making money; good for promotion; good for fame or power? All this may also be attained by work which, from another point of view, would be considered very bad work. Without traditional wisdom, no answer can be found.

What, then, would traditional wisdom have to say? It would derive all answers from its knowledge of the task and purpose of human life on earth.

The human being's first task is to learn from society and "tradition" and to find his temporary happiness in receiving directions from outside.

His second task is to interiorize the knowledge he has gained, sift it, sort it out, keep the good and jettison the bad. This process may be called "individuation," becoming self-directed.

The third task is one which he cannot tackle until he has accomplished the first two, and for which he needs the very best help he can possibly find. It is dying to oneself, to one's likes and dislikes, to all one's egocentric preoccupations. To the extent that a person succeeds in this, he ceases to be directed from outside, and he also ceases to be self-directed. He, has gained freedom or, one might say, he is then God-directed. (If he is a Christian, that is precisely what he would hope to be able to say.)

If this is the task before each human being, we can say that "good" is what helps me and others along on this journey of liberation. I am called upon to "love my neighbor as myself," but I cannot love him at all--except sensually or sentimentally--unless I have loved myself sufficiently to embark on this good work of development.

How could I love and help my neighbor as long as I have to say, with St. Paul: "My own liberation baffles me. For I find myself not doing what I really want to do but doing what I really loathe"? In order to become capable of doing good work for my neighbor as well as for myself, I am called upon to love God, that is, strenuously and patiently to keep my mind straining and stretching toward the highest things, to levels of being above my own: only there is goodness to be found.

This is the answer given by traditional wisdom, that is to say, by the metaphysics that has given rise to all the great civilizations. From it we can derive all the guidance we need. What are a human being's greatest needs? As a spiritual being, he is primarily and inescapably concerned with values; as a social being, he is primarily and inescapably concerned with other people and also with other sentient creatures; as a person, he is primarily and inescapably concerned with developing himself.

Accordingly--as, I suggest, anyone can confirm from his own experience--there are three things healthy people most need to do and education ought to prepare them for these things:

To act as spiritual beings, that is to say, to act in accordance with their moral impulses--Man as a divine being.

To act as neighbors, to render service to his fellows--Man as a social being.

To act as persons, as autonomous centers of power and responsibility, that is, to be creatively engaged, using and developing the gifts that we have been blessed with--Man himself and herself. In the fulfillment of the human being's three fundamental needs lies happiness. In their unfulfillment, their frustration, lies unhappiness.

In a subtle way, modern society has made it increasingly difficult or even impossible for most of the people most of the time to meet these needs. And "education," including "higher education," seems to know little about them. Strange to say, most people do not even know what these needs are. For reasons well known to traditional wisdom, human beings are insufficiently "programmed." Even when fully grown, they do not move and act with the sure-footedness of animals. They hesitate, doubt, change their minds, run

hither and thither, uncertain not simply of how to get what they want, but uncertain, above all, of what they want.

If education is unable to teach them what they want, is it of any use? Questions like What shall I do with my life? or What must I do to be saved? relate to ends, not merely to means. No technical answer, such as Tell me precisely what you want, and I shall teach you how to get it, will do. The whole point is that I do not know what I want. Maybe all I want is to be happy. But the answer, Tell me what you need for happiness, and I shall then be able to advise you what to do, again will not do, because I do not know what I need for happiness. Perhaps someone says, For happiness you need the truth that makes you free--but can the educator tell me what is the truth that makes us free) Can he tell me where to find it, guide me to it, or at least point out the direction in which I have to proceed? Maybe I feel that good work is what I am really longing for. Who can tell me what good work is and when work is good?

Traditional wisdom teaches that the function of work is at heart threefold: (1) to give a person a chance to utilize and develop his faculties; (2) to enable him to overcome his inborn egocentricity by joining with other people in a common task; and (3) to bring forth the goods and services needed by all of us for a decent existence.

I think all this needs to be taught.

What is the current teaching with regard to work? I do not quite know, but, at least until quite recently, I heard it said everywhere that the real task of education was not education for work, but education for leisure. Maybe this extraordinary idea has now been abandoned. Fancy telling young and eager souls, "Now, what I really want you to envisage is how to kill time when you have nothing useful to do."

As our ancestors have known (it has been expressed by Thomas Aquinas), there can be no joy of life without joy of work. This is a statement worth pondering. Laziness, they also know, is sadness of the soul. This, too, is worth pondering. A nineteenth-century thinker said something like this: Just watch it a bit. If you get too many useful machines you will get too many useless people. Another statement worth pondering.

The question is raised: How do we prepare young people for the future world of work~ and the first answer, I think, must be: We should prepare them to be able to distinguish between good work and bad work and encourage them not to accept the latter. That is to say, they should be encouraged to reject meaningless, boring, stultifying, or nerve-racking work in which a man (or woman) is made the servant of a machine or a system. They should be taught that work is the joy of life and is needed for our development, but that meaningless work is an abomination.

A sensitive British worker wrote this:

It probably wrong to expect factories to be other than they are. - After all, they are built to house machines, not men. Inside a factory it soon becomes obvious that steel brought to life by electricity takes precedence over flesh and blood. The onus is on the machines to such an extent that they appear to assume human attributes of those who work them. Machines have become as much like people as people have become like machines. They pulsate with life, while man becomes a robot. There is a premonition of man losing control, an awareness of doom.

It is probably wrong to expect, he says, good work. He has been conditioned not even to expect it? He has been conditioned to believe that man himself is nothing but a somewhat complex physico-chemical system, nothing but a product of mindless evolution--so he may suffer when machines become like men and men become like machines, but he cannot really be surprised or expect anything else.

It is interesting to note that the modern world takes a lot of care that the worker's body should not accidentally or otherwise be damaged. If it is damaged, the worker may claim compensation. But his soul and his spirit? If his work damages him, by reducing him to a robot--that is just too bad. Here we can see very clearly the crucial importance of metaphysics. Materialistic metaphysics, or the metaphysics of the doctrine of mindless evolution, does not attribute reality to anything but the physical body: why then bother about safety or health when it comes to such nebulous, unreal things as soul or spirit? We acknowledge, and understand the need for, the development of a person's body; but the development of his soul or spirit? Yes, education for the sake of enabling a man or woman to make a living; but education for the sake of leading them out of the dark wood of egocentricity, pettiness, and worldly ignorance--at the most, this would be a purely private affair: does it

not smack of "copping out" and "turning one's back on reality"? Materialistic metaphysics, therefore, leaves no room for the idea of good work, that work is good for the worker. Anyone who says, "The worker needs work for the development and perfection of his soul," sounds like a fanciful dreamer, because materialistic metaphysics does not recognize any such need. It recognizes the needs of the body; that they can be met only by somebody's work is an unpleasant fact and perhaps automation will soon abolish it. Meanwhile, the work needs to be done. Let's get on with it, but make sure the body doesn't get hurt.

If we see work as nothing but an unpleasant necessity, it is no use talking about good work, unless we mean less work. Why put any goodness into our work beyond the absolute minimum? Who could afford to do good work? What would be the point of making something perfect when something imperfect would do as well? Ananda Coomaraswamy used to say: "Industry without art is brutality." Why? Because it damages the soul and spirit of the worker. He could say this only because his metaphysics is very different from that of the modern world. He also said: "It is not as if the artist were a special kind of man; every man is a special kind of artist." This is the metaphysics of good work.

How, then, could there be education for good work?

First of all, we should have to alter the metaphysical basis from which we proceed. If we continue to teach that the human being is nothing but the outcome of a mindless, meaningless, and purposeless process of evolution, a process of "selection" for survival, that is to say, the outcome of nothing but utilitarian--we only come to a utilitarian idea of work: that work is nothing but a more or less unpleasant necessity, and the less there is of it the better. Our ancestors knew about good work, but we cannot learn from them if we continue to treat them with friendly contempt--as pathetic illusionists who wasted their time worshipping non existing deities; and if we continue to treat traditional wisdom as a tissue of superstitious poetry, not to be taken seriously; and if we continue to take materialistic scientism as the one and only measure of progress. The best scientists know that science deals only with small isolated systems, showing how they work, and provides no basis whatsoever for comprehensive metaphysical doctrines like the doctrine of mindless evolution. But we nevertheless still teach the young that the modern theory of evolution is part of science and that it leaves no room for

divine guidance or design, thus wantonly creating an apparent conflict between science and religion and causing untold confusion.

Education for good work could then begin with a systematic study of traditional wisdom, where answers are to be found to the questions 'What is man? Where does he come from? What is the purpose of his life?' It would then emerge that there is indeed a goal to be reached and that there is also a path to the goal--in fact, that there are many paths to the same summit. The goal can be described as "perfection"--be ye therefore as perfect as your father in heaven is perfect--or as "the kingdom," "salvation," "nirvana," "liberation," "enlightenment," and so forth. And the path to the goal? *Good work*. "Work out your salvation with diligence." Don't bury your talents and don't let anybody else bury them. He who has been given much, of him much will be demanded. In short, life is some sort of school, and in this school nothing counts but good work, work that ennobles the product as it ennobles the producer.

In the process of doing good work the ego of the worker disappears. He frees himself from his ego, so that the divine element in him can become active. Of course, none of this makes sense if we proceed from the basic presuppositions of materialistic scientism. How could the product of mindless evolution, whose abilities are only those selected by blind nature for their utilitarian value in the universal struggle for survival--how could such a product of chance and necessity free itself from its ego, the center of its will to survive? What a nonsensical proposition? And the assumption of the existence of a divine element in man is, of course,

"The world of work," as seen and indeed created by this modern metaphysics, is--alas? --a dreary place. Can higher education prepare people for it? How do you prepare people for a kind of serfdom? What human qualities are required for becoming efficient servants, machines, "systems," and bureaucracies? The world of work of today is the product of a hundred years of "deskilling"--why take the trouble and incur the cost of letting people acquire the skills of a craftsman, when all that is wanted is a machine winder? The only skills worth acquiring are those which the system demands, and they are worthless outside the system. They have no survival value outside the system and therefore do not even confer the spirit of self-reliance. What does a machine winder do when (let us say) energy shortage stops his machine~ Or a computer programmer without a computer?

Maybe higher education could be designed to lead to a different world of work--different from the one we have today. This, indeed, would be my most sincere hope. But how could this be as long as higher education clings to the metaphysics of materialistic scientism and its doctrine of mindless evolution? It cannot be. Figs cannot grow on thistles. Good work cannot grow out of such metaphysics. To try to make it grow from such a base can do nothing but increase the prevailing confusion. The most urgent need of our time is and remains the need for metaphysical reconstruction, a supreme effort to bring clarity into our deepest convictions with regard to the questions 'What is man? Where does he come from?' and 'What is the purpose of his life?'

6. The Party's Over

In the beautiful hills of Surrey, where I live, you can go for walks, and even on a Sunday you never meet anybody, though you may hear the distant roar of traffic down to the coast. And the story goes that an economist went there for a Sunday-afternoon walk, and he met none else than God Almighty, which gave him a bit of a shock, and he didn't know what to say. He remembered that as a little boy he had been told that what is a thousand years to us is but a minute to the Lord. And he asked Him "Is this so?" and the Lord said, "Yes, this is quite so." By that time he had recovered his composure, and he said to Him, "Then perhaps it may also be true that what is a million pounds to us is only a penny for you." And the Lord said, "Yes, that's quite true." And he said, "Well, Lord, give me one of those pennies." The Lord said, "Certainly, my dear chap. I don't happen to have it on me, but just wait a minute while I fetch it."

And so it is with the salvation expected from the growth of GNP just wait another minute and we shall all be rich and happy. This notion is becoming increasingly questionable, It's an awesome view one takes from outside the United States, GNP-wise the most successful country of the world, unbelievably high gross national product, and, to put it mildly, a country with problems. A country with poverty, indeed a country with degrees of poverty that many other countries at a much lower GNP are not experiencing. I'm not saying this in a spirit of criticism, but simply in analysis. After all, the Western Europeans are pursuing the same aims; they're only less successful Americans.

To me, this concept of GNP means nothing at all. I know, for certain technical reasons of managing certain money flows in the economy, it may be quite useful; but as a measurement of any kind of achievement to me it's meaningless. Because it's a purely quantitative concept. Statistics don't have to be accurate; they have to be significant. My theory has always been that figures don't mean anything if you can't make them sing. How can anybody assert that "growth" is a good thing? If my children grow, this is a very good thing; if I should suddenly start growing, it would be a disaster. Therefore, the qualitative discrimination is the main thing; it's far more important than some mysterious adding-up of everything. We've all learned at school that you must add together only things of essentially the same quality. So you can't add together apples and the number of evenings spent watching television; this is meaningless. Let's look at the qualitative aspect of the whole matter. Surely our job is always to make up our minds what's good and do our best to let the good grow; and to make up our minds what is evil or not so good and try to diminish it. Whether the two processes, put together, mean a new growth or a net diminution shouldn't interest anyone. The quality of life--not the quantity-- yes, that's what matters. GNP, being a purely quantitative concept, bypasses the real question: how to enhance the quality of life.

If you take the world distribution of income, you get very, very many people extremely poor, very many people extremely rich, hardly anybody in the middle. This is a pathological distribution. That is to say, there is not one world anymore. Even at that humble level any semblance of unity has been lost. This applies not only as between the rich countries and the poor countries, where it applies in a horrifying form; it also applies inside many societies. All the developing countries are evermore becoming dual societies with a lot of people immensely poor, a few people immensely rich, and nothing in the middle.

Some people don't observe the idea that they have purposes in life other than the material. To put it in the shorthand of Christian language, their job is really to save their souls and they are using far more of the material means than is necessary for this purpose, and it's most likely that therefore they are greatly hindered. So we see that the rich society, that is, the very few people at the rich end, cannot possibly be a model for the world as a whole, and unless we find a new model we are just going to drift deeper and deeper into disaster. The question is, Is there another pattern that would make life really

worth living~ These patterns have existed and they have produced some of the greatest works of art and culture that we know of. And they were produced in a culture of poverty, not in a culture of affluence.

What is the culture of poverty? It seems to me that it is a culture in which a very firm distinction is made between two categories of goods, which I shall call the ephemeral goods on the one hand, goods produced in order that they should be destroyed, and eternal goods--perhaps eternal is too big a term--goods which are not to be destroyed, on the other hand. They may be destroyed by accident, but that's not their purpose. In all real cultures the eternal goods were outside the economic cultures, because, after all, how can you calculate eternity~ When they built a cathedral, they didn't budget it, they said, "Only the best is good enough. Only that which can be offered to the glory of God is worthy of the dignity of man." But when they came to ephemeral goods they lived frugally.

I visited Florence a year ago for the first time. Opposite this fantastic cathedral there is the statue of the architect, and on the pedestal is the Latin inscription, which, with the greatest difficulty I deciphered. It said, "This is Arnolfo, who, instructed by the municipality of Florence to build a cathedral of such splendor that no human genius can ever surpass it. On account of the superlative endowment of his mind he proved equal to this gigantic task." Instructed, you see. Outside the cathedral are the famous bronze doors by Ghiberti, and you learn that it took 'him twenty-eight years to do them. There was no patronage behind it; no economist calculated that if these bronze doors were made in twenty-five years instead of twenty-eight, the tourist trade would be increased by three years. The tourist trade has increased by 3000 percent; you can hardly see the doors now, but that is another matter.

The moment we allow the economic calculus to invade everything, then nothing becomes worthwhile anymore. I tried to imagine what it would look like if I found the statue of the architect opposite one of the high-rise office-block buildings in London. It would probably read, "This is Mr. R. W. Smith, member of the Royal Institute of British Architects, who, instructed by the Greater London Council to create an office block of such superlative cheapness per square yard, per square foot, that no human genius can ever underbid it, on account of his superb endowment with computers ' proved equal to this mean task."

Our problems are so serious that the best way to talk about them is lightheartedly. All we can hope is that, with the many improvements that are really beginning and trying to get us straight, we should not dissipate our powers by neglecting the strength of science and technology. What is needed is a redirection of them, making use of the best stock, and not wasting too much time in being heroic and reinventing the wheel. Get organized, make the best use of people, even those who are not like-minded, who are just as jittery about the future as anybody else, but who can help you.

There are three ways to develop a new intermediate technology. One way is to take the existing very low- level technology and say simply, look, this can be up- graded. It can be done much better, and if one has the eye for it, one finds it can be enormously improved with virtually no capital investment. That's one way, upward.

Another way is to say, Well, now here we make this marvelous equipment but our production processes are designed mainly to save labor. But this machinery is not suitable for poor countries. Let's, in a sense, downgrade it, to fit it into the condition of the developing country.

The third way is to conceive it anew, to lay on design studies after one has conceived the right question. To get the peasants of the developing countries to do this themselves is very difficult; in most cases they just do not have the resources to do it. They have fewer scientists. That's the tragedy. Where a country does swing around and say, Now we want to work on our own problems, which has happened to some extent in a country like Ghana, all things become possible. But too many are looking to imperial College, London, or Cornell or MIT, instead of attending to the problems of their own country. You don't get much innovation, much real reconsideration of technology, from the developing countries. You don't get much, but there is still quite a lot, taking the world as a whole, and therefore one of the most important activities to be undertaken--and we are undertaking it with our slender resources--is to survey the world and see what already exists and evaluate it and perhaps test it. The Filipinos have some absolutely excellent, very simple equipment for rice culture, and so have the Japanese. We see if that equipment is suitable for other conditions and, if it is, make it available.

Now we come to a definition of the whole thing. It's a funny thing how the word, the concept, which is merely a label attached to some intuition, some knowledge, then becomes the thing itself. The Buddhists have a nice

expression, that Buddhism is the finger pointing at the moon. The moon is the thing, Buddhism simply directs your attention to it. So a phrase like "appropriate technology" or "intermediate technology" is simply a finger pointing at the moon. And the moon can't be fully described; it can be pointed out in terms of specific situations.

I was asked in the early 1960s to go to India. I didn't know what to do about rural India, but I traveled the whole country, by every conceivable conveyance or non conveyance, and finally I came back to Delhi and wrote them a little memorandum about it and they assembled all the planners for a two-day seminar. I said, The question that must be raised is, what is the appropriate technology for rural India? The answer, to the best of my insight, is an intermediate technology, something much better than the hoe and much cheaper and easier to maintain than the tractor plow. So, if I make myself understood, intermediate is an answer. At first I got a very bad reception and I left in a huff. But fifteen months later they arranged an all-India conference on intermediate technology. (They still didn't like the term so they called it appropriate technology. That's all right, it's a purely formal term, it makes my life very easy: when I come to India and somebody, as happened quite recently, comes to me and says, Oh, Mr. Schumacher, I don't believe in appropriate technology, I just look him straight in the face and say, Oh, that's splendid. Do you believe in inappropriate technology?)

To determine what precisely is appropriate is pretty difficult, but it has to fit the particular situation. Normally in the rural areas markets are small and the big mass-production units don't fit, so one of the subsidiary definitions is probably that it will be a small unit. I've recently been to Sri Lanka and they told me, We have little sugar estates all over the place but have only one big sugar refinery. To take all the cane into that one place now, with oil costs, transport costs, is uneconomic. Where can we get mini-plants? They had inquired all over the world. They decided that no one had such a plant; the "big system" is not interested. In fact, the mini-plant for sugar refining, just the thing Sri Lanka needs, has been developed in India against the opposition of the large-scale sugar industry. Now that it exists, everybody says, Thank God it exists; now the little people of Sri Lanka and other places have a chance of making a living.

The second point, perfectly obvious, is that in rural areas--poor countries--we do not have an intellectual infrastructure so that we have only to whistle and there comes your manager, top engineer, lawyer, etc. The appropriate

technology at the intermediate level will be simple enough that you don't have to have these specialists.

To illustrate, let's say you set up a factory, making anything, in the desert. You find it very much more difficult than setting up a factory in, say, Denver. Why? Because in the desert there is no infrastructure, that is to say, you'll have to build the roads, you'll have to bring the people nearer the factory. You'll have to build the houses for these people, you'll have to build schools for the people, and hospitals, etc., etc. You can't walk out the front door of the factory because you have an accountancy problem and around the next corner you find a first-class accountant. You've got to maybe fly him from thousands of miles away. If you need a new personnel manager you can't, as you can in Denver, just put an advertisement in the local paper and you immediately get twelve applicants. So all those things that are givens when you do it in Denver, that you don't have to bother about, but not givens out in the desert, that is called infrastructure. The infrastructure in many places has accumulated over the years, several generations, and in the European countries for hundreds of years. It includes an immense number of wires and tubes and pipes beneath the roads. If they have to be created in a poor country, in a hurry, they're immensely expensive. Each mile of road can run into millions of dollars. So if you have to have an elaborate infrastructure first and then a mass-production industry, you have to wait a long, long time and I don't know where the wealth would come from to build this elaborate infrastructure. But if you have small-scale it doesn't require an elaborate infrastructure and you can become productive quickly and then perhaps later you will have the wealth to make the infrastructure a bit more elaborate. That's all I mean.

In Burma I found the Buddhists, Burmans like it if one speaks in parables. And I said, Well, you know, there's a road and from the road there's a path and by the path there's a shed. And in the shed is a hen that lays an egg. Well, now, all that--the road, the path, the shed, the hen--is not what you want. You want only that one egg. If you spend all your money on the road, the path, and the shed, you're then broke and can't even have a hen to lay an egg; it's not very good business. So you want to minimize the infrastructure requirement; you want to produce in such a way and at such a location that you don't have to spend all your money on roads, paths, sheds, and the like, and you can spend more money on getting more hens to lay more eggs.

Third, since we are dealing with poverty and not with rich people, it's useless to go to them with some extremely expensive apparatus, wonderful as it may be, and say, Please get out of my way and I'll show you how to do things, which means I'll show you what you can do when you're rich. The poor watch it with increasing astonishment and say, Well, we're not rich so it means nothing to us. It just proves to us that we are nothing. It destroys people. It's what we call, in high-faulting language, a negative demonstration effect. Then we can go home and talk about the culture gap and how we can close it. Intermediate technology says, No, if I want to help I must be genuine about it and become a poor man myself to understand it, and then I quickly realize what fits. Certainly it must be something which can be done without this great capital intensity. Please notice I am not saying that it can be done labor intensively, I am not aiming at that, but rather at capital saving. They are very different things. I have no one who enters the situation imaginatively and feels that he wants to do useless labor, so labor intensity as such is not desirable. But capital saving is desirable.

These are some of the criteria that come only gradually into one's mind, and because the child has to have a name we call it intermediate technology. It's a difficult approach because the aid givers, who are they? Basically they are townies, but the problem can be solved only in the rural areas and the gap between townie and country folk is immense. They are, in a manner of speaking, educated and they try to help people who, according to their criteria, are less educated. The gap between the educated and the uneducated is enormous. And thirdly they are rich and they are trying to help the poor and the gap between rich and poor is also enormous. So there are three big chasms to be bridged, which requires extreme effort of the imagination, at which we, the rich countries, the aid-giving countries, have been very poor. We said, We have the answer, now get out of the way and we'll implement it.

Here is a really symbolic example of simple technology that can serve as a symbol for the whole thing, about a different way of thinking. Much of the third world is arid country, not because it doesn't rain, but because the rainwater flows off into the rivers and down into the sea for certain reasons. The Lord has arranged it so that by and large it rains everywhere; there are few places that are exceptions. In some places, like England, it rains all the time; in other cases it comes in great big blobs, and when it comes in great big blobs it runs off the soil very quickly unless you are very careful. Now don't let it run down to the river and out to sea, and say, "Oh, we've got that

marvelous technology, we'll build a desalination plant." Even if you do it, you still have fresh water only in one place when it's wanted all over the country. You want the water when you want it--that is the thinking. Don't be misled by the marvelous things we do; do the necessary things. Give your intelligence to the construction, for instance, of underground rainwater tanks. Of course we know how to do it expensively. How can we do it cheaply? How can we do it so that the actual expenditure the villager has to make for materials he doesn't have is minimized? Maybe he has to put in a lot of labor. But in many of these countries there's a great surplus of labor. That is appropriate technology, as an example.

I'll give you another example. In order to have efficient oxcarts, the wheels ought to have steel rims. We've forgotten how to bend steel accurately except with big machines in Pittsburgh or Sheffield. How do you do it in a small rural community? Is it beyond the wit of man to do this on a small scale? No, we remember that our forefathers knew how to do it before James Watt, and they had a most ingenious tool. We found one of those tools in a French village, more than two hundred years old--brilliantly conceived, clumsily made. We took this to the National College of Agricultural Engineering in England and said, "Come on, boys, you can do better than that. Upgrade it, use your best mathematics to work out the required curvature and what have you." The upshot of it is that while hitherto in the modern world the smallest instrument to do this bending job would cost something on the order of Pounds 700, and require outside power and electricity to operate, this tool upgraded to the level of knowledge of 1974 can be made by the village blacksmith. It costs Pounds 7, it doesn't require electricity, and anyone can do it. Now this is something quite different from going back into the pre-industrial era. It is using our knowledge in a different way, and we know it can be done.

I emphasize our interest in nonagricultural activities in rural areas. There is only a given amount of land and if the population increases they have to subdivide the land more and more and more. The urgent need is to bring industry into the rural areas.

A couple of years ago I went to a place about ninety miles out of Delhi, called Khurja. In the late 1940s the government of India said Khurja is the idea place where we can make our own crockery. We don't have to import it. They set up a pottery development station but nothing happened. The center attracted several first-class technical people. One was Mr. T. N.

Sharma, and he realized that nobody had got down to the problem of technology. He persuaded the government to send him around the world to study the technology. He went out as Mr. Sharma but he came back as Dr. Sharma, and immediately he was offered the manager ship of a big mass-production firm in Calcutta, which he accepted. Suddenly he remembered himself; Good Lord, I was going to help these poor fellows in Khurja. And so he went to Khurja and selected out of all that he had seen the appropriate technology for the little man. Within twelve years, three hundred pottery factories have grown out of the ground like mushrooms.

I was there and found thirty thousand people that are now earning a living from pottery and hospital porcelain and electrical porcelain. It is magic. I was fascinated. Three hundred firms. I moved around and I got hold of a chap who was employing a couple of hundred people. And I said, Where do you come from? He said, I come from the Punjab. Why did you come here? Are you a traditional potter? Oh, no. I come from a farming village. Why did you leave there? No land. My brother's got the land. And where did you learn this? You are running a factory now. I learned it from Dr. Sharma. Well, yes, Dr. Sharma brought you the implements and so on, and trained you, from a technical point of view; but where did you learn management? He said, Learn what? You just manage, he said. Well, I said, you have three hundred people here who come off the farms from little villages and are entrepreneurs employing altogether thirty thousand people. How many go bankrupt here? He said, I've never heard of one. One has to think about this. I have no reason to believe that this totally frank chap was telling lies. I asked other people. We assume that all of this is so extremely difficult because we have created this extremely complex technology. But when it is back to reality, to real simplicity, then management ceased to be a great problem.

Recently I was seated in a restaurant, next to a family of three, a father and mother and a very bright little boy, I would think between eight and ten years of age. They studied the menu, and the boy said, "Oh, I want liver and bacon." The waitress was there; the father studied the menu, the mother studied the menu, and then the father ordered three steaks. The waitress said, "Two steaks, one liver and bacon," and went off. The boy looked at his mother and said, "Mummy, she thinks I'm real? "

This question, Are we real? , arises particularly in this vast country. I know these situations in industry, when certain people who have been doing

the same boring job for a long time are, perhaps by chance, perhaps by way of policy, treated as people: and they experience something similar to this little boy. Good Lord, they think, in this place I'm real; I'm not just a means to an end.

Yes, I think you are put into this life with the task of learning to distinguish between that which is really real and really important and permanent and of true value on the one hand, and things trivial, amusing, ephemeral, and of no real value on the other hand. Your intellect has to make that distinction. The world has to attach itself to the things that really matter and not to those ephemeral trivialities which make the most noise. That is the message of religion. I know it is normally handed down in all sorts of other ways, but unless you do that you are an unhappy, messed-up person. It has taken me a long time to discover why Religion has split up into so many different religions; it's so you can choose the one that is the most practical for you. The most practical to me was the Roman Catholic version of Christianity, and now I am relieved of such totally offbeat questions as: How could something incredible, like the human being, have come about by an accidental combination of atoms? So I say, Come off it, this is just stupid. I don't know how it is, but I believe there is a Creator. The moment I believe in this higher level, it would be most improbable that the Creator could have put into life such loquacious beings as you and I and never say a word to us. He has actually communicated to us.

This is called by the simple word "revelation." We have the sacred books of mankind, and having spent many, many years studying them, not only in the Christian tradition, I find that it's the same spirit that is communicating to all of us. By various means, in a subtle way, an educative way. You always have to stretch yourself to understand; it is not meant to be automatic. This is the great education we can receive in life, and once we get hold of that, then suddenly we find that we are no longer worried, we have energy actually to act in this life, we can distinguish between the phony and the real questions, and we're happy.

Our system has been extremely destructive and I think we must get down to the metaphysical or, if you like, the philosophical or religious causes of this situation. We have been hearing lately a great deal of the tragedy of the commons, which shows the metaphysical deterioration from which we are suffering, because as a matter of historical fact, the commons in Western Europe were well looked after. But of course, when this feeling that man is

the servant of this world in a sense, or at least a trustee, was organized out of our thinking, then the commons were no longer maintainable. So it is those causes that we have to become aware of. It is quite true that tinkering with the present system has very little effect, except where the tinkering represents a return to the true values. It is of little use to call for a very big change in values without at least incorporating these values in some new structures, no matter how small. Because as we know, or as some of us know, we have been told that in the beginning was the word but then the word must come and become flesh and dwell among us. We are now locked in a crisis of this modern civilization which has given up, more or less, the two teachers that mankind had.

What are these two teachers? One is the marvelous system of living nature: the town civilization is not in touch with that system. And the other one is the traditional values, the traditional wisdom of mankind, which we have also rejected and replaced by some extraordinary structure which we call objective science.

Let us try to utilize this opportunity to recall to our minds what a human person really is. I am saying nothing original, I just remind myself of it. First of all, in some way or another, whatever way you try to express it, he comes from the divine level onto this earth. He is a son or daughter of the divine. Second, he is a social being; he doesn't come alone. He is put into this social context. And third, he or she is an incomplete being. He has been sent here to complete himself. From this insight have been formulated all the ethics and all the instructions to the human race. As a divinely arrived being he is called upon to love God in traditional language. As a social being he is called upon to love his neighbor. And as an incomplete individual being he is called upon to love himself. The social organization ought to reflect these three absolute needs. If these needs are not fulfilled, if he can't do it, he becomes unhappy, destructive, a vandal, a suicidal maniac. The social, political, and economic organizations ought to reflect these needs.

But they do not. Let's take the lowest of the three, namely the need to complete himself with joyful, constructive labor, work, to feel that he is, as a child of God, created. Well, in most jobs he can't do it. Most jobs have been organized to be as dull as anything can possibly be. This is now one of the critical points in many parts of the world because people are no longer prepared to accept it. This is a situation that is still, as it were, cushioned: in some places where you have migrant labor they can still be pushed around.

But all that is now finishing. So the kind of industrial trouble that we have in England arises because we don't have a cushion of recent immigrants who will allow themselves to be pushed around. We don't have foreign workers as Germany and many other European countries have and the British are no longer prepared to tolerate certain industrial conditions. They say, You put your thinking cap on and make something that is humane.

The other need, to serve one's neighbor, and the first need, namely to act as a divinely derived being in accordance with our moral impulses, are also frustrated to a very large extent by the size of our organizations. It is only in a small organization that we can meet people face to face and make decisions face to face.

In large organizations all sorts of little people have to implement rules and regulations, and rules and regulations can never be fair. As Thomas Aquinas said, Justice, untempered by mercy, is brutality. Mercy, uncontrolled by justice, is the mother of dissolution. So if you have a big structure you have to have a lot of rules and regulations and the little people who have to deal with the clients and customers and so on. They can't act in accordance with their moral impulses: they say, Oh, I'm sorry, I am here only to execute the rules I am given. I agree, it is most unfair, but I can't do anything about it. So his impulses are frustrated and you get this extraordinary possibility, namely at the top and throughout the ideology of the big thing, the good intentions and the moral people create, because of wrong structuring, an immoral, wicked effect.

I could put it also in another way, which has certain advantages because it embraces the whole of our life, that if the size of the unit is wrong, this means inevitably the eradication to a large extent of T.L.C. Now T.L.C. is the only fertilizer that really works. Don't inquire where you can buy it--you can make it yourself. T.L.C. means tender loving care, and this is what our life needs. When it is organized out of the system, then everything becomes unproductive and madly expensive. Agriculture is a good example of this: through the technological development, the withdrawal of human labor from agriculture, the substitution for T.L.C. of chemicals and big mechanization, we now have a system that has no real future because it is based totally on nonrenewable fossil fuels, and instead of working with nature it bullies nature.

It is very interesting in Britain, time and again our planners will take good agricultural land and build a new council housing estate upon it and then we environmentalists protest that this is an alienation of land and we don't have enough land anyhow. It is criminal to withdraw this land from food production. But three or four years later we find that fifty families have settled on this land, they all have their gardens, and the land produces more than the farm has ever produced. All because the T.L.C. factor has been brought back into it.

Everything is just a matter of the carrying capacity of this earth. There are studies which show that when food production is done on a sort of family scale, intensively, then the output per acre is on the average five times as high as that of a well-run farm. In Britain, where we produce only about half the food that we need, all our modern people--I call them the people of the forward stampede--say, With ever increasing application of chemicals we must double food output. Then they say it is impossible anyhow, yet they now have a plan to increase food output by 3 1/2 percent a year. Actually it is falling by about 7 percent a year. These people are almost unteachable. The question has to be raised, Can we afford agriculture in Britain' I don't think we can really afford agriculture, we can afford only horticulture, where we get really high output per acre, and this requires a new structure. This is the sort of constructive work that we now have to do. Getting down to details. We must realize that we are making a bad job today, a very bad job, and we must ask ourselves, How can we make a better job tomorrow~ Let us see the abnormality in the things we consider most normal.

This system is wrong; it doesn't work properly. And the further intensification along the same lines is just tripling the case of fanaticism. Fanaticism has been defined as an attitude of redoubling one's efforts when one knows one is on the wrong track. People are worrying their heads about their standard of living when the world around them, where it really matters, is collapsing. I mean, it is not a thing to be taken lightly that in many, many places in the so-called rich world it is really hazardous, even for a man, upstanding, big man, to try to walk home after dusk alone. These are the real things, the gadgets are not real: if I get mugged, that is a real thing.

I will tell you a moment in my life when I almost missed learning something. It was during the war and I was a farm laborer and my task was before breakfast to go to yonder hill and to a field there and count the cattle. I went and I counted the cattle--there were always thirty-two--and then 1

went back to the bailiff, touched my cap, and said, "Thirty-two, sir," and went and had my breakfast. One day when I arrived at the field an old farmer was standing at the gate, and he said, "Young man, what do you do here every morning?" I said, "Nothing much. I just count the cattle." He shook his head and said, "If you count them every day they won't flourish." I went back, I reported thirty-two, and on the way back I thought, Well, after all, I am a professional statistician, this is only a country yokel, how stupid can he get. One day I went back, i counted and counted again, there were only thirty-one. Well, I didn't want to spend all day there so I went back and reported thirty-one. The bailiff was very angry. He said, "Have your breakfast and then we'll go up there together. And we went together and we searched the place and indeed, under a bush, was a dead beast. I thought to myself, Why have I been counting them all the time? I haven't prevented this beast dying. Perhaps that's what the farmer meant. They won't flourish if you don't look and watch the quality of each individual beast. Look him in the eye. Study the sheen on his coat. Then I might have gone back and said, "Well, I don't know how many I saw but one looks mimsey." Then they would have saved the life of this beast.

There I learned something. I then also found that in all human traditions there has been a very great antagonism against all this counting business. I don't know how many of you still know your Bible, but you can find it in two places, in Chronicles and Kings. The first chap who arranged the census was King David, and when he arranged the census the Lord was utterly furious. He gave him a choice between three penance punishments. And David, said, Yes, yes, I know I have sinned. He didn't argue back. You know, those old Jews used to argue back very freely. He immediately understood there was something wrong in having a census which treats people as if they were units, whereas they are not. Each is a universe.

End of book

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