

the OFFICE OBSERVER

**JOBS
AND
INFLATION**

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EDITORIAL OFFICES

OECD Information Service, Château de la Muette, 2, rue André-Pascal, F 75775 PARIS, CEDEX 16.

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EDITOR: Jane Bussière

ASSOCIATE EDITOR:

Ulla Ranhall-Jeanneney

ART, PRODUCTION AND LAYOUT:

Marc Delemme

ASSISTANT:

Gérald Tingaud

PHOTO RESEARCH:

Silvia Lépot

Rina Maiden

All correspondence should be addressed to the Editor.

JOB'S AND INFLATION



David Lea, Assistant General Secretary of the Trades Union Congress in the United Kingdom questions OECD's economic strategy for failing to give first priority to unemployment (page 5). John Fay, OECD's Director for Publications Policy and former Head of the Economics and Statistics Department, answers that OECD governments are indeed concerned with reducing unemployment but that the reduction must be a durable one. For most countries this means continuing to focus on the fight against growth-destroying inflation (page 3). What is needed is not only "correctly judged" demand management but also supply-side measures to encourage

adaptation and increase productivity. Two kinds of supply-side measures are examined in this issue: policies to improve the functioning of labour markets (page 9) and policies to encourage innovation (page 15). Examples of innovation policies in the food industry (page 18) and in agriculture (page 24) are described. Another article looks at recent experience with incomes policies and warns against trying to use them as a "quick fix" (page 14).

PHOTOS: Cover: Pavlovski — Sygma; page 4: J.P. Laffont — Sygma; page 5: Harlingue-Violet; page 7: Central Office of Information, London; page 8: Almasy; page 10: Alain Noguès, Pavlovski — Sygma; page 12: Bundesbildstelle, Bonn; page 13: Central Office of Information, London; page 14: Yomiuri Shimbun; page 20: Suntory Ltd.; page 21: Ajinomoto Co., Inc.; page 25: Reichel — Centre national de la recherche scientifique; page 26: Dr. J.H. Becking, Institute for Atomic Sciences in Agriculture, Wageningen, The Netherlands; page 27: INRA.

OECD STRATEGY REVIEWED

By John Fay (1)

The *OECD Observer* intends from time to time to invite outside contributors to comment on the Organisation's work or policies. It hopes, thus, to enlarge public understanding of the complex issues at stake in the economic world today. Observer articles have previously been drawn almost exclusively from the OECD Secretariat and others directly connected with the Organisation.

The first outside contribution, from David Lea of the British Trades Union Congress, is on page 5 of this issue. Mr. Lea assesses, critically, the economic strategy that OECD governments agreed upon when they met in Paris at political level in June. (2) And drawing on his wide international experience, he argues for action to follow up the Brandt Report on North-South relationships.

There is more common ground than could, at first sight, appear between Mr. Lea's views and those of OECD. There are also important differences. It is not our intention, here, to "reply" systematically to every difference. But a brief and selective commentary may clarify some of the more neuralgic points in today's public debate — and to try to do so is, indeed, the object of inviting critical assessment from outside the immediate circles of OECD.

A first point is that OECD's Strategy does not dismiss growth and high employment as major objectives. Its object is to restore both. Far from favouring zero growth, OECD thinking is highly conscious of the dangers of protracted stagnation — what we have called "the low-growth trap" — and of the subsequent emergence of what David Lea calls "the zero-sum-game mentality", with everyone desperately defending what they have to the exclusion of economic progress. OECD governments stated, in June, that unemployment is "unacceptably high". Their concern is to reduce it — durably.

The problem, as always, is to get from here to there. As Mr. Lea says, no good purpose can be served by ignoring where we start from. If there were any doubt about the adverse effects of continued high inflation on sustainable growth and job-creation, it must surely have been dispelled by the experience of the past decade. Very briefly, inflation erodes confidence and distorts spending decisions throughout the economy. In particular, it weakens investment by squeezing actual and prospective profits and by increasing the risks attached to large capital projects. Weak investment means that any acceleration of total demand is likely to be brief — either fizzling out or leading quickly to capacity bottlenecks.

But towards the end of the past decade — the last couple of years or so — another vitally important experience has surfaced. When, as happened in certain countries between 1978 and the second oil crisis, inflation subsided markedly, renewed growth began. What was particularly welcome was that this growth featured a revival of the investment that is clearly essential if a new era of expansion is to be underpinned.

This experience was particularly marked in Germany and Japan. But there were signs that other countries were beginning to travel the same yellow-brick road before it was blocked by the new energy crisis. Economic historians and theoreticians will argue about how far the recovery was due to expansionary monetary and fiscal policies, or how far it was the direct result of falling inflation and rising confidence. But there can be little doubt that *without* the containment of inflation, expansionary policies would have been largely fruitless.

OECD's present concentration on the reduction of inflation is partly based on the distaste that any democracy must have for the social disruption that inflation causes by the unequal — and often arbitrary — way in which it affects different sectors of the population. But it is also based on the realisation that it is inflation that does most to suppress growth and job-creation, and that more stable prices are essential if governments are going to achieve the economic conditions that public opinion in North and South alike are claiming. The bleak short-term forecasts put forward by the OECD Secretariat in July (3) are consistent with optimism that growth can be resumed when the current upsurge of inflation has clearly been brought under control and the consequences of the latest oil price-hike absorbed. More stable costs and prices lead to greater confidence — and more expansionary spending decisions — by business and the consumer alike. And better stability will enable governments to take stimulative fiscal and monetary action if these prove necessary to secure the recovery that all desire.

Announcements of the demise of neo-Keynesianism in OECD circles are probably premature, if by neo-Keynesianism is meant a belief that modifications of fiscal and monetary policy, when correctly judged, can favourably affect prosperity and employment. But the point is that these modifications must be gauged correctly. If they are not, they lead to the familiar process of stop-and-go, and to increasing uncertainty rather than to the confidence that the world economy, now, so largely lacks. It is doubtful, to say the least, that tax

(1) *OECD Director of Publications Policy, former Head of the Economics and Statistics Department.*

(2) *The Strategy was described in a special supplement to the OECD Observer in late June.*

(3) *OECD Economic Outlook N^o. 27: Summarised in the July OECD Observer N^o. 105.*



"Governments will regret the day they wash their hands of the responsibility for full employment", David Lea. "OECD's governments have stated that unemployment is unacceptably high. Their concern is to reduce it durably", John Fay. Above: an employment centre in Canada.

cuts, public expenditure increases or monetary relaxation can achieve anything better than a very temporary and cosmetic stimulus to our economies if they are administered when the inflationary surge is still strong. But timed and quantified appropriately, they can and do help governments to achieve their economic objectives.

If these remarks dispel misunderstandings about the demand side of the OECD Strategy, the discussion inspired by Mr. Lea's contribution to the debate will already have been invaluable. But there are vital points to be made on the supply side as well. Indeed, it is on this side that thinking has probably advanced most significantly in the last year or so, and it is probably on policies to increase the efficiency of our economies that the ability of governments to dispel inflation and re-create economic growth will primarily depend.

On the supply side, what Mr. Lea calls "adaptation" is the name of the game — perhaps a better name than the "positive adjustment" which OECD has used to date. We have, most urgently, to adapt our economies to the dictates of the energy market, reducing both our dependence on imported oil and our total energy consumption per unit of output. Second, we have to adapt in the light of technological change in other fields — so that we benefit from the micro-chip, or whatever, instead of wasting time trying to hold the waves of innovation at bay. Third, we have to adapt to the emergence of increasingly efficient third-world producers, allowing them to exploit the comparative advantage that they are evolving in certain fields and shifting our own productive efforts towards the up-market goods and services where we enjoy the advantage and they provide a hungry market. Without continuous adaptation of the international pattern of output, it will be virtually impossible for the newly-industrialising countries to participate in the sort of economic development in which democracy can thrive.

David Lea emphasises that adaptation is not easy without growth. Unless the total cake is increasing, people will not willingly relinquish the slice that they have in the interest of obtaining a different and better slice. "Pie in the sky — when you die by and by" is no more popular today than when our ancestors coined the refrain in earlier times of economic adversity. This, indeed, is one of the things that OECD has had in mind in warning about "the low-growth trap".

But we do not believe that adaptation can be encouraged through overall economic policies which concentrate on growth in the short term and ignore the problems of inflation. We would underline a

somewhat different dimension. Adaptation itself can powerfully help to reduce inflation, because it encourages competition and efficiency and discourages costly defensive attitudes at all stages of the productive process. Vigorous pursuit of adaptation policies will itself reduce the inflation constraint on growth, engendering a dynamic process in which growth and adaptation are mutually reinforcing. It requires no stretch of the imagination to appreciate the extent to which continued high inflation makes adaptation difficult. It saps confidence in all sectors of the economy and entrenches exactly the *sauve qui peut* defensive attitude (I'm all right Jack) that governments want to eliminate if domestic prosperity, and international welfare in the widest sense, are to be encouraged.

David Lea's commentary on relationships between OECD countries and the so-called Group of 77 (embracing both the OPEC countries and the non-oil developing countries) will surely receive a sympathetic hearing. The very recent analysis by the Brandt Commission (4) has already been widely praised by OECD governments. Its proposals provide food for thought, and hopefully for action, in the context of the global negotiations that are about to open between North and South.

The Lea article accentuates the need for discussion between "the principal actors in the dialogue, both at international and national level", to improve the common understanding as to what the situation requires. We believe that consultation is vital if clearer understanding is to be achieved, and doubt if any OECD government would dissent. Indeed, when they met in OECD at Ministerial level in June, governments referred particularly to the importance of dialogue between the social partners on the consequences of oil-market developments and on the role that labour-market and other policies can play to improve both the investment climate and the employment situation. Prominent in the minds of many OECD governments now is the need to alleviate the worst ravages of youth unemployment.

Particularly welcome, from a leader of trade union opinion, is Mr. Lea's insistence that dialogue must be both national and *international*. At national level, sovereignty implies consent. And at international level, prosperity is indivisible between North and South, rich and poor. The world is small, and time is not unlimited.

(4) Programme for Survival. Report by the Independent Commission on International Development Issues.

“KEYNES PLUS” THE ONLY WAY FORWARD

by David Lea, Assistant General Secretary,
Trades Union Congress (TUC), United Kingdom

Although history may not repeat itself exactly, the similarities between the world of the 1980s and that of the 1930s are becoming more and more disturbing – accompanied by the same half-truths about “pulling in our belts”, indeed all of the shibboleths to which Roosevelt and the New Deal, plus rearmament, were eventually the answer.

But should one expect this pre-Keynesian thinking from the OECD? One reads in the July *Economic Outlook* the measured tone of the forecast that OECD unemployment will rise from 20 million to 23 million in the next year but looks in vain for any sign that its reduction is to be the first priority.

So we have the prospect of a year of zero growth in the OECD and a minus figure in some countries, not least the United Kingdom, where the distinguished columnist, Mr. Peter Jenkins, commented in *The Guardian* on July 2 as follows on the latest set of unemployment figures: “Officials remain blasé about these panics, like battle-trying troops returning to the front. They have been steeling their nerves for what is now happening. As at the Somme or Passchendaele, it is all going according to plan.”

Governments will regret the day they wash their hands of their responsibility for full employment and try to make ordinary workers and their representatives into the scapegoat for what is clearly a growing crisis on a global scale. It is for Government to determine whether they allow this to become “a crisis of the system”.

“Keynes is dead”, so the commentators keep telling us, to which the appropriate comment would seem to be: “Yes, and he must be turning in his grave.” The “bankers’ remedies” which Keynes opposed in the 1920s and 1930s are being peddled – and bought – once again.

“Full employment in the 1980s; no return to the 1930s” is now the motto of trade unions around the world. And does anyone really need to point out that we can’t look to another war to get us back to full employment?

Trade Unions and Structural Adaptation

For many years, trade union leaders have been urged to believe that for them the challenge of economic growth is the challenge of structural adaptation, moving from low productivity to high productivity sectors or from lower to higher forms of technology. The equation has read: “No adaptation, no growth”.

But is it not equally clear that the equation can read the other way round?: “No growth, no adaptation”? Or to put the point yet another way: does anybody expect trade union leaders – or anyone else for that matter – to be able to sell the proposition: “Rapid structural adaptation – yes; growth – no”? Yet, wittingly or unwittingly, that is precisely the dilemma Governments are putting us in.

Since the *Economic Outlook* reiterates the rather deflationary prescriptions of the OECD Council Ministerial communiqué, how can

one take any comfort from the reference to the need for “a combination of policies directed at reducing underlying inflation, enhancing productive potential and reducing energy dependence”?

We cannot accept that the “second oil shock” should be a justification for higher unemployment. To the extent that energy prices have to rise relative to other prices as part of a strategy for energy conservation, the change in the terms of trade should not necessarily affect the level of employment.

You cannot expect trade unionists to be interested in structural adaptation if there is no growth in job prospects because they will see this as working themselves out of a job.

Even with reasonable growth prospects, a period of rapid



John Maynard
Keynes, a 1926
photo
taken in Berlin
where he gave
a speech
entitled
“The End of
Laissez Faire”.

technological and structural adaptation inevitably increases the uncertainty associated with decisions about investment, location, research and development, trading patterns, product ranges and the organisation of work — as well as the wider uncertainties concerning employment and income.

We hear a lot about “confidence” on the part of investors being the precondition for new capital investments; yet is it not equally apparent that successful adaptation depends on “workers’ confidence” — confidence that they will not be made unemployed as a consequence of change?

If adaptation is fundamental to future progress, then equally the achievement of consent is an essential condition for that adaptation to occur. An agreed approach is clearly the best way by which the fears and suspicions attendant on such uncertainties can be allayed.

So whether they like it or not, Governments have to recognise that our economies are now characterised by institutions on both sides of industry which have to be brought into decision-making, and which have to be involved in compromise and social consensus.

The Effects of New Technology on Growth Rates

The problem of structural adaptation is now being linked by many people with that of the new technology. This in reality turns on the more familiar problem of what determines the level of employment.

Some people think that the new technology is leading to a significant step-up in the level of productivity and therefore that there will be less employment for any given level of output. On that view, “productive potential” — in other words the growth rate consistent with any given level of unemployment — must be going UP.

The statistical evidence, however, at the present time would appear to be that “productive potential” is going DOWN. Obviously, both cannot be true simultaneously.

From my experience of chairing a trade-union working party on employment and technology (1) I think it is vital for Governments urgently to reflect on the implications of slow growth for attitudes to new technology.

It is in everyone’s interest that we do take advantage of new technology, at least to the extent that it enables us to halt and reverse this apparent slowing down in the growth of productive potential. This is not an impractical target as the new technology, particularly the microchip, is affecting the service industries with their lower productivity (at least as presently measured) just as much as manufacturing.

Trade union leaders are trying to explain on this reasoning that new technology, combined to some degree with shorter working hours, is by no means incompatible with a return to full employment. But do governments ever put themselves in the shoes of trade union leaders who do believe that new technology is one of the conditions of increasing living standards? I doubt it. Because if they did, they would quickly find that it is extremely difficult to answer the following types of question from workers’ representatives: “If the oil price increases are going to be the excuse for zero growth, won’t new technology just lead to rising unemployment?”

It is no good saying that it would be easier not to start from there.

The only answer we can give — and it is far from satisfactory — is that the race is on internationally to develop and introduce new technology, and those nations which do not compete will have even higher unemployment.

In that connection I do not think that we can disregard the association, in a country such as Japan, between guarantees of employment security and a record of rapid technological adaptation.

At the same time — and this is a point which the Japanese unions accept — a period of rapid adaptation necessitates an expansion of ex-

penditure on social capital. This is for three reasons. First, because the distribution of the benefits of higher productivity across the whole community through social expenditure is a necessary condition for winning consensus for change; second, because only social expenditure can provide the levels of training, education and manpower measures needed to enable adaptation to occur; and third because the public service sector will remain a key area for the provision of new job opportunities.

But when urging the need for increased social expenditure, we must also recognise that there is a problem of measuring what we are already getting in this field (which should receive greater attention from statisticians). In medicine and education in particular, we are creating unnecessary dissatisfaction by the “zero productivity increase” statistical assumption which appears not to accord a measured value to the clear advances which all but a minority of sceptics would recognise. And public services are, in fact, quickly seen to be part of our living standards whenever governments are tempted to remove them.

There is no neutral economic formula which determines what is the proper share of the national income which should go to public services, but there is a need for a wider understanding of the processes involved. Improved public services do require a widening of the tax base. I have little doubt that by 1990 there will be more people working in the public services than in 1980. So the question of “tax morality” becomes an important one. The political process has to accommodate both sides of the argument about tax levels and the quality of the public services.

If we want public services, we’ve got to pay for them, but if we allow the “black economy” in which many activities escape the tax net, this naturally causes resentment on the part of those who cannot escape and necessitates higher tax rates in the official economy than would otherwise be the case.

In the TUC Group we have coined the phrase “technology agreement” to denote the process by which we believe unions and employers can derive a mutual benefit from technological change, granted that all the problems facing the enterprise cannot be solved at that level.

The moral of all this is that to increase productive potential requires not only technological advance and structural adaptability but a wider understanding of economic choices. My main question in this article is the following: Are we keeping equally in view all the main economic objectives? I argue that a “multiple trade-off” solution constitutes the only hope of success.

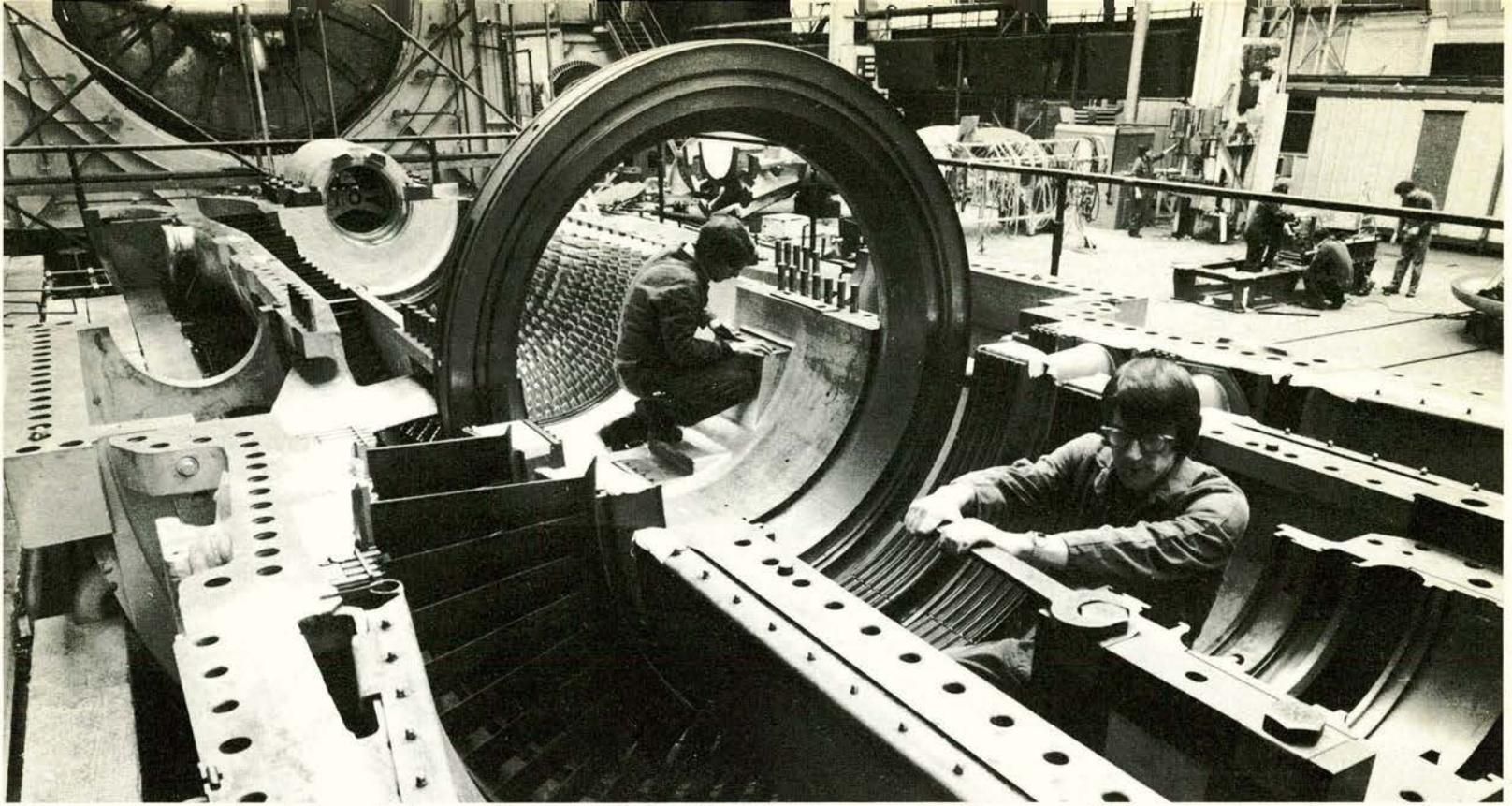
Multiple Trade-offs

Modern economies work best when there is a close working relationship between the Government and the trade union movement, resting on political democracy and genuine trade union autonomy. Trade unions are a natural expression of democracy — industrial democracy, a concept which has to be widened and deepened as societies develop.

The nature of a consensus is that it involves a trade-off. The search for a new consensus has to proceed from an understanding that it is not a single trade-off that is involved but a multiple trade-off. This is the essence of what has been termed the “*Keynes Plus*” (2) approach. This approach argues that governments, trade unions and employers must accept a joint responsibility to create full employment policies. Such policies can be constructed only if the political will and commitment is present on all sides to democratise the process of capital

(1) Employment and Technology, TUC 1979.

(2) “*Keynes Plus: A Participatory Economy*” European Trade Union Institute 1979.



"You cannot expect trade unionists to be interested in structural adaptation if there is no growth in job prospects." Above : Production of a gas turbine compressor in the United Kingdom for an aluminium smelter in Dubai.

accumulation and its allocation. In other words, a mix of general and selective measures is needed on both the demand and the supply side, along with priority for securing a greater consensus over the distribution of income and wealth. Inflation reflects a lack of global consensus as well as national consensus. Prices, international or national, are not contained by competition as traditional economic theory postulates. Elements of world oligopoly as well as national oligopoly will continue to be a feature of price determination, and micro-economic "supply side" policies can only be a partial remedy.

The structural changes that have occurred in our economies mean that market mechanisms and price indicators are not by themselves sufficient to ensure industrial reconstruction, or to detect potential imbalances or mismatches in sufficient time, without an altogether unacceptable degree of waste and disruption. Markets often fail to sound the necessary warnings or even sound warnings that are incorrect. The power of OPEC, as the classic example of oligopoly in the modern world, actually provides a stark illustration of the general rule — that oligopoly has been with us for a long time, but we only complain about it when we are on the receiving end.

Yet "market individualism" cannot meet the complex needs of our societies on a national level any more than "beggar my neighbour policies" can provide a solution globally.

The multiple trade-off is here particularly daunting, but it is a permanent necessity. There is no alternative to reaching real agreement by talking directly to the principal actors in the drama, both at international and national level. There is no doubt in my mind that trade union involvement in decisions is part and parcel of the long-term education process in all countries and need not be seen as a complete antithesis to "the realities of the market place".

There is still unfortunately no evidence that OECD Ministers have acknowledged the point made in the trade union statement to the Venice summit drawn up by the Trade Union Advisory Committee to the OECD: "Most Governments seem to forget that low growth or no growth is another source of inflation and creates further conflicts within society, strengthening the tendencies to make workers carry the whole burden of austerity. Trade unions are ready to play their part in the policy making for economic growth, structural reform, price

stability and full employment. But this requires that every Government respects the fundamental role in determining economic policies that trade unions have come to play."

The extent to which Governments prove equal to that challenge will determine whether trade unionists are able to achieve "security in change" or whether instead they will feel driven back to seeking a more temporary and less satisfactory solution.

We need a new consensus. The only certain point is that those politicians who preach the end of consensus will not meet the historical necessities of today's world. "We all live here" has to be our motto.

North-South, Brandt, and the Role of Transnational Corporations

One cannot fail to be struck by the fact that, although everyone from the leaders at the Venice summit to the International Chamber of Commerce is paying lip service to the Brandt Report, no one is actually picking up its main recommendations.

Surely the fact that Brandt does tackle head-on the trilateral relationship between OECD, OPEC and the Group of 77 is the strongest point in its favour, suggesting that the current polarisation in UN bodies such as UNCTAD, the World Bank and the IMF can only be broken by a new style of summit.

Thus, even after the special session of the UN General Assembly in New York in September, it may still be necessary for the Mexican Government to press its proposal for a trilateral summit in Mexico City in the early part of 1981. I know this would have the support of the Mexican trade union movement.

Trade union leaders are accustomed to being short of friends, but let me take this welcome opportunity to answer the charge that we are economic nationalists:

- In a world of threatening increased polarisation, both between North and South and within the OECD, the trade union movement can and does build bridges; these bridges will be of growing significance if we want a stable world society in the year 2000. In June, I addressed the first General Session of the newly formed Com-



"Brandt notes that trade unions have in most instances resisted the temptation to demand protection from competition on the part of developing countries." Above: an optical factory in South Korea.

monwealth Trade Union Council, which has member organisations in 40 Commonwealth countries. The CTUC conference gave full backing to the philosophy of the Brandt report.

- Investment by transnationals increasingly determines the pattern of trade and hence North-South economic relations. "Free trade" has already given way to "managed trade".

- North-South bodies which bring together trade union representatives at the headquarters of the transnational corporations are a vital condition for understanding the role of these corporations in North-South relations. It was, I understand, precisely the realisation that such links can assist structural adaptation which finally led Commissioner Davignon of the EEC to join with Commissioner Vredeling in proposing an EEC Directive which would establish information and consultative bodies in transnational corporations.

- The social contract which binds us all together is the principle enunciated by Brandt of a "mutuality of interest". But Brandt emphasises that this mutuality of interest is not yet actual, only *potential*.

Let us not allow this motto to become yet another slogan to be suffocated by indifference or strangled by cynicism.

Keynes may be dead. But surely if he were alive today he would spare no effort to follow Brandt in asserting the global validity of his damning indictment of those who would view the spectre of mass unemployment and than pass by on the other side.

He would certainly also take up another point: that if we have no growth, then the "zero sum game" mentality of "more for you means less for me" (or "more jobs in your country means less jobs in my country") will become an intractable problem. Redistribution requires growth to be sustainable. This is just as true on a global level as it is within the nation state.

Brandt's recommendations amount to a global bargain, and invite governments and international organisations to participate in global negotiations for mutual benefit. The Brandt Commission has performed a great service in asserting that social objectives must be an integral part of world development aims. That comes out of the report in many ways: in the basic call for a redistribution of income in favour of the developing countries; in the recognition that employment in all countries is the means of meeting both physical and psychological

needs and of promoting a more even distribution of income; in the statement that a wide participation of working people is needed to put economic and social reforms into effect. Apart from the recognition that the social objectives are desirable in themselves, there is also the welcome acknowledgement that economic advances will not be possible without accompanying social reform.

Brandt notes that trade unions have in most instances resisted the temptation to demand protection from competition on the part of developing countries. Tribute is paid to the free trade union movement and to its progressive attitude to the liberalisation of trade and cooperation for development. But when living standards are held down by repression of trade unions and by exploitation rather than lack of development, trade unions raise questions. Internationally, failure to achieve basic social standards can be an obstacle to the opening of new trade opportunities for the countries of the South.

It would serve no purpose for trade unions automatically to endorse Government development plans. Their contribution is to point out the practical difficulties which have to be overcome and sometimes the difficulties which, with the best will in the world, cannot be overcome. If development programmes are to work, they have to enlist broad popular support, and trade unions provide the means for winning that support. That is an urgent need because the trends in many countries point in the opposite direction.

International Monetary Reform

Finally, I would like to add my voice to those who call for a new initiative on international monetary reform. I base these thoughts on the consensus of the recent Arusha Conference (3). The post-1945 international monetary system has broken down. The ensuing inflationary and speculative disorders are inflicting serious damage on the majority of peoples and countries.

Inflation, protectionist tendencies, competitive deflationary policies, unstable exchange markets, unregulated Euro-currency transactions, recurrent and growing balance of payments disequilibria and the "conditionality" of the International Monetary Fund: these are problems which affect us all, though in different ways.

This points to the common interest, shared by the countries of the OECD, Eastern Europe and the Third World alike, to articulate a new monetary system that would reflect the employment and development needs of people living in different material conditions, social systems and cultural environments.

If there is an area in which interdependence has almost immediate effect, it is that of money and finance.

Conclusion

The key words then are interdependence and multiple trade-off: greater trade union participation equals greater trade union understanding. More discussion of the market environment is not the antithesis of planning — either of domestic resources or of world trade. Attention to structural adaptation is not the alternative to employment security but a necessary condition for it.

Above all — reverting to the phrase "Keynes Plus" — we cannot accept the waste of resources on a global scale as a deliberate policy based on arcane economic reasoning. World economic and monetary policy must be the *servant* of human welfare, not its master.

No longer — if it ever were the case — can the issues which we are debating be kept behind closed doors. They affect workers in Manchester and Milan, Toronto and Toulouse. Trade unions have a vital part to play in arriving at the broader consensus which is now so urgently required.

(3) *Communiqué of the North-South Conference held at Arusha, Tanzania, in July 1980.*

IMPROVING THE FUNCTIONING OF LABOUR MARKETS⁽¹⁾

In many OECD countries there seem no realistic immediate alternatives to rather tight demand management if oil-induced inflation is to be contained and inflationary expectations dampened. Looking further ahead, however, a stabilisation policy which relies primarily and continually on demand restraint runs two important risks:

- There may be growing social unrest and political pressure for relaxation of policies before inflation is under control.
- Even if these pressures are resisted and price stabilisation targets attained, the eventual upswing (whether endogenous or policy-induced) could re-accelerate inflation long before full employment has been restored. A sharp turnaround in income expectations, higher wage claims, sectoral or geographical labour shortages, renewed shortages of raw materials, notably energy, and other bottlenecks might well emerge at a relatively early stage of the re-expansion, because the prolonged period of slack may have damaged supply potential and supply elasticity of OECD economies.

Hence, the attention currently being paid to the supply side, including measures to alleviate the unemployment caused by anti-inflationary policies and to improve the trade-off between unemployment and inflation. This article focusses on some measures intended to affect the level and structure of labour supply and demand.

Eliminating Distortions in the Labour Market

Because "labour" covers many heterogeneous activities, and because wages are slow to adjust to changes in demand of and supply for manpower, labour markets seldom "clear" spontaneously or rapidly: labour shortages and labour surpluses often occur simultaneously in particular markets. Hence there is a permanent need for active manpower policies which will affect both demand for and supply of labour in those markets which are subject to great and persistent disequilibria. In the context of the firm anti-inflationary policies presently required, active labour market measures will be needed not only to alleviate unemployment by eliminating local or occupational discrepancies between supply and demand ("mismatch" unemployment) but also to improve the employment opportunities of special groups which otherwise would have to carry too much of the unemployment burden. For the future, if non-inflationary expansion is to be achieved, the overall functioning of the labour market must also be improved.

The problem

The rapid extension of welfare systems over the past decades has fundamentally affected the labour market. Income transfers, such as unemployment compensation, and income taxes sometimes act as a disincentive to labour supply. Equally important, there may be disincentives to the demand for labour: for example, employer payroll taxes have been the main source of increased government revenues in many countries, and the rise in these taxes has been the most active element in the rise of total labour costs. Since these taxes usually have ceilings (and are, therefore, regressive) they tend to discourage the employment of low salaried workers and contribute to overall unemployment.

A similar problem arises in countries having a high minimum wage or union-negotiated base rate for unskilled workers. By imposing a premium on what otherwise would have been "the market wage" for some workers, especially labour market entrants, such wage floors are likely to reinforce the trend towards excess supply of these workers. Similar distorting influences occur at the other end of the income scale: professional cartels based on restricted entry allow some groups to receive what amounts to "economic rent"; and in some countries narrowing income differentials have reduced the supply of highly skilled manpower.

Other important factors affecting the long-term functioning of the labour market are the increasing specialisation of labour and a shift in the composition of employment to white-collar, information-processing and service-intensive jobs. These changes have increased the need for job-specific and firm-specific training which workers cannot sell on the external market, and which induce them to stay with the firm. By the same token, employers have an incentive to protect the returns on their investment in training and will tend to strengthen the tenure of workers in their firms. This "internalisation" of the labour market helps to assure an efficient allocation of labour within the firm but not necessarily within the economy as a whole, especially if major shifts in the structure and location of production are required.

Prolonged slack in the labour market is itself creating conditions which may increase structural imbalance and distortion in the functioning of labour markets. Increased aversion to risk in the face of declining market prospects is a normal reaction, not only on the part of entrepreneurs, whose investment is in physical capital, but also on the part of workers who must invest in their future careers: high unemployment and uncertainty about future demand for particular products, technologies or skills makes workers less willing to undergo retraining or to change jobs, regions or occupations in search of better careers elsewhere. Likewise, it may reduce the propensity of firms to invest in on-the-job training for its workers or to relocate in areas with large labour surpluses.

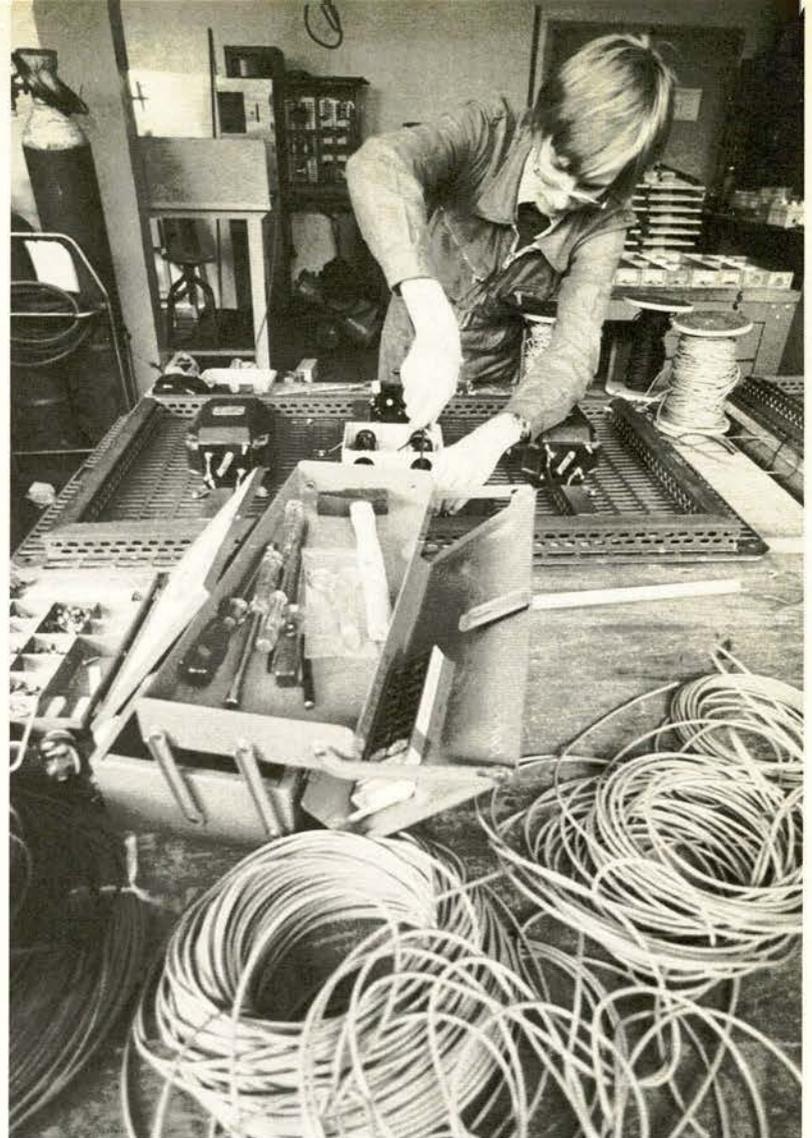
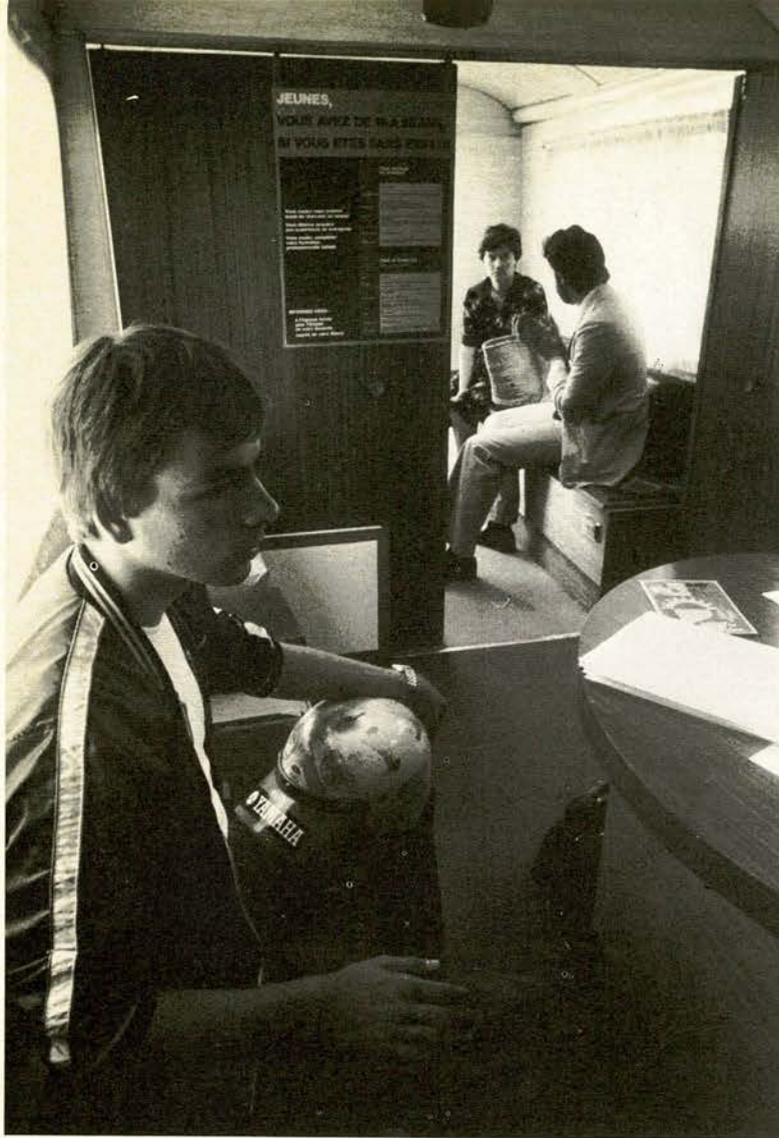
The declining propensity of workers to change jobs is most sharply reflected in the growing emphasis on greater job security in many OECD countries. The result is a reduction, often a substantial one, in job opportunities for young workers, which helps to explain the phenomenon of youth unemployment in the OECD area, now 3.5 times as great as adult unemployment. (In the 1960s the figure was only 2.5). Unemployment of young people is not only a waste of resources but a mortgage on future growth: unused skills, lack of work experience, and loss of the chance to learn by doing and mature in a work environment, are likely to reduce the productivity of young people in future.

The policies

There are two main constraints on policies to eliminate distortions in the labour market:

- The long-term improvement in social standards is and should be

(1) This article has been drawn from work carried out in OECD's Economics and Statistics Department and Social Affairs, Manpower and Education Directorate.



"The declining propensity of workers to change jobs is sharply reflected in growing emphasis on job security which reduces job opportunities for young workers... Unemployment of young people is not only a waste of resources but a mortgage on future growth. Unused skills and lack of work experience are likely to reduce the productivity of young people in future."

irreversible; what can be done is to attenuate the negative effects of such improvement on the labour market.

- The distortions resulting from sluggish growth of demand are difficult to remove so long as new job opportunities are not available.

The latter point is of particular importance for the very short run when governments will be compelled to maintain an extremely tight macro-economic policy stance in order to get the inflationary upsurge under control.

Active labour market measures (vocational guidance, training, counselling, help in placement) and corrective intervention (retraining, subsidies, relocation of jobs and workers) have their best effects when the directions of structural change are reasonably clear. In a context of slow growth and strong and erratic cost shocks, it may be more difficult to interpret market signals and to distinguish temporary from permanent shifts in demand and supply. Unfilled vacancies may provide some guide but must be interpreted with caution since reporting standards and coverage of these statistics vary from one occupation to another and over time.

The main policy objective of active labour market policies therefore must be to maintain or increase the productive *potential* of the labour force, and this at the lowest possible cost to the public. For training, this means imparting basic and transferable skills, providing financial incentives for on-the-job training in skills which are at least minimally transferable, promoting remedial education, combined with work experience, in public or subsidised private jobs for the long-term unemployed – in particular young workers experiencing long-term or frequent unemployment.

In addition to traditional techniques for improving geographical mobility such as allowances for moving, settling, separation and installation, it can be helpful to provide housing facilities or housing loans; to guarantee the transferability of private and public pension rights; to tax fringe-benefits which, if untaxed, tend to grow relative to taxable wage incomes, and to discourage workers from leaving their firms.

But labour mobility between regions should not be viewed as an end in itself: increased migration into already congested urban areas can even be detrimental, creating external diseconomies in these areas while migration, particularly of younger workers, out of sparsely populated rural areas can endanger the economic viability of these zones. Hence, measures to increase labour mobility need to be complemented by measures to enhance the mobility of capital in regional policy and development programmes.

In spite of major improvements in recent years, the employment services in many countries are not yet flexible enough. They could make greater use of more sophisticated methods and improve their ability to provide up-to-date information and advice as well as outreach programmes for the long-term unemployed and for discouraged workers who have withdrawn from the labour market. Closer cooperation with local firms and the establishment of consultative machinery to encourage manpower planning in the firm are important tasks which urgently need development.

Unemployment compensation systems, with their extended coverage and improved benefit levels, could be used to offset market imperfections, and such compensation could be made taxable. There

appears to be scope for reform: introducing differentiation in benefits, in waiting periods and/or in duration of payment. Differentials could be based on such criteria as local labour-market conditions, intensity of efforts devoted to finding a job, constraints on mobility, family income, age, previous labour market experience etc. The administrative cost of providing some of these alternatives may be high, however, and must therefore be weighed against expected benefits in terms of labour supply.

The level of — and changes in — minimum wages need to be carefully monitored so as to ensure a balance between equity and labour market efficiency. It is important to see that minimum wages in real terms develop in line with overall productivity (adjusted for terms-of-trade changes) instead of reflecting inflationary cost and price increases. It would also be appropriate to spell out the costs, in terms of employment of disadvantaged workers, of introducing (or sharply increasing) minimum wage levels.

Employment Subsidies

Employment subsidies are payments to firms — either direct or through tax credits — intended to increase employment by reducing the cost of employing labour. Many OECD countries, influenced by their experience during the recession of 1974-1975, have introduced such subsidies or expanded existing programmes. These subsidies can be applied to counteract cyclical unemployment, or structural unemployment, or both. They are generally aimed at the “marginal” worker: the one who is in danger of losing his job during a recession and can be kept on as a result of the subsidy, or the additional worker who can be hired due to the subsidy.

Used as a counter-cyclical tool, the initial effect of the subsidy can be to stimulate the economy by reducing the cost to the enterprise of employing workers and enhancing profitability. Used as a structural tool, it lowers the price of labour (or certain types of labour) relative to capital (or other types of labour) and hence encourages substitution of labour for capital (or one kind of worker for another). If the emphasis is on the counter-cyclical function, the subsidy will be of relatively short duration, the main objective being to reduce the time lag between the resurgence of production and the growth of employment when there is an upswing. If the emphasis is on the structural function, the subsidy will be required over a longer period, so that employers can be induced to change their decisions about how much labour to use relative to other factors of production (or types of labour).

Subsidies can be “targeted” i.e. directed to workers who have difficulties in finding jobs and who have physical, psychological, social or economic disabilities. The subsidy would reduce the extra cost of hiring such workers. Hiring these disadvantaged workers who have to carry a more than proportional share of the unemployment burden is less likely to push up the general level of wages than would the employment of other workers. A targeted subsidy for job creation can, therefore, be less inflationary than the stimulation of demand for goods and services.

The theory

Given the constraint exerted by inflation on expansionary demand management, targeted job creation subsidies can, thus, attenuate the inflation-unemployment dilemma.

Such subsidies are likely to exert their greatest effect when operated simultaneously — and closely coordinated with — expansionary demand conditions. When general demand has been allowed to reduce unemployment as much as it can without generating additional wage and price pressures, targeted employment subsidies can make further dents in joblessness.

When the introduction of subsidies involving major increases in public expenditure is coupled with a corresponding cut in other expen-

ditures or an increase in taxes, the effect on the budget would be neutral and aggregate nominal demand broadly unchanged. Whether there would be any effect on employment depends on whether or not the job-creating effects of the subsidy outweigh the job-destroying effects associated with its financing. Even if the number of jobs created on balance is insignificant, a budgetarily neutral subsidy used selectively, on behalf of disadvantaged groups, but financed non-selectively, out of the general budget, could have benefits:

- It could reduce unemployment differentials between regions and occupational groups.
- It could improve the functioning of the labour market by realigning the costs of employing target groups whose wages may, because of institutional or market distortions, be out of line with their productive performance.

Hence targeted employment subsidies might be appropriate even now, when restraint of demand is still necessary in many countries. While their potential for net job creation would be small, their impact on the redistribution of employment and unemployment between groups of workers or regions could be very useful — reducing structural impediments to future expansion of output and alleviating some of the worst social problems of today.

A subsidy designed to counteract youth unemployment would be a case in point, particularly where this problem is caused by minimum wage or job security provisions. A youth employment subsidy could effectively realign the cost of employing a young worker with his or her productivity. To the extent that the acquisition of work experience increases the skills and thus raises the productivity of the subsidised young workers, the subsidy could — and should — be phased out gradually.

Once general demand restraint can be relaxed somewhat, job creation subsidies can be useful as part of a range of supply-side policies, to achieve a non-inflationary absorption of labour market slack.

The Implementation

The actual implementation of employment subsidy schemes may be difficult. As in the case of other selective measures, the administrative costs can be quite substantial, and a trade-off must be made between maximising the scheme's impact (by setting criteria of eligibility for example) and raising the costs of administration and control. Narrow targeting reduces the risk that employers will have “windfall profits” for workers they would have hired anyway but makes it less likely that the subsidy programme will actually be used. Moreover, within the group of disadvantaged workers selected as a target, the effect of the subsidy may well be to skim off the least difficult cases and lower the chances of employment for the most disadvantaged within the group. Lack of sufficient information and cumbersome administrative procedures can make employers reluctant to participate in subsidy programmes, and these drawbacks are likely to be more pronounced if the subsidy is a short-term one.

Redistribution of Employment Opportunities : Work Sharing

What about measures to reduce labour supply? Are they less problematic than expansionary demand management measures or more so? This question cannot be answered unambiguously since there is only very limited empirical evidence but merits careful consideration.

At present, growth in the OECD area is primarily restrained by inflation or by the fear of accelerating inflation. As no general “breakthrough” on the inflation front is as yet in evidence, it is relevant to ask whether there are non-inflationary ways in which unemployment can be reduced by sharing the available work between the employed and the unemployed. —>



Employment subsidies and work sharing can be "targeted" towards workers who have physical, psychological, social or economic liabilities.

The idea of work sharing implies a reduction either in hours or in labour force participation, in order to make way for those who are out of work. The former can be achieved through restricting overtime, prohibiting double job holding, shortening the work day or week, or providing longer holidays. The latter can be achieved by longer schooling, earlier retirement and certain other forms of temporary or permanent withdrawal from the labour force.

The theory

It is not difficult in theory to conceive cases in which work could be shared *without* an increase in *inflationary pressures*. If the reduction in hours of those already at work is accompanied by a corresponding cut in earnings, unit wage costs would not rise. However, the existence of fixed costs means that, to be cost neutral, work sharing would have to be accompanied by a rise in productivity. Such an increase is not inconceivable since people who work fewer hours may be more efficient and since the cut in working hours may prompt firms to use their capital stock more intensively through shift work, alternating work teams in a longer week etc. (providing demand for the output of the firm is rising). If productivity increased enough, costs would actually fall. The cost reduction could be ensured by making the reduction in hours contingent on rearrangements of working hours which would enhance efficiency.

Measures designed to reduce participation rates could also be neutral as to costs — if, for example, people are encouraged to retire with a reduced pension before the legal age limit and the "discount" fully offsets not only the loss of pension contributions but also the

longer period of pension payment. Insofar as the productivity of those opting for earlier retirement were lower in relation to their incomes than that of their replacements, this case too could involve a reduction in costs for the employer, and if the newly recruited person would otherwise be eligible for unemployment benefits, the public transfer burden would be reduced.

The impact of work sharing on the level of *employment and unemployment* depends on a variety of factors. On the labour supply side any intended reduction could be partly or wholly thwarted if the cut in working time — or more flexible work arrangements — prompted more people from outside the labour force to seek gainful employment or if those at work were to increase their overtime. The same would be true if those who have more leisure were to take a second job, legal or illegal (moonlighting), or possibly even if they were to devote themselves to do-it-yourself activities which deprived others of paid work.

On the demand side, the redistribution of work between the employed and the unemployed may be partly or wholly frustrated if those giving up work are not promptly counter-balanced by new recruits. Moreover, while increased productivity as discussed above would help to contain inflation, it might also reduce the scope for absorbing unemployment unless aggregate demand were to increase in step.

The practice

Here, again, the practice may be difficult in a situation of strong inflationary pressures and slow or even negative real growth. Work

sharing without prior acceptance of income sharing (or income-growth sharing) would reinforce the inflationary struggle for income distribution and, by reinforcing rather than diminishing present constraints on growth, would be counter-productive. The number of employed workers willing to trade off paid work for more leisure may not be very great in a period in which inflation is eroding real incomes and in which wage restraint within the framework of collective bargaining is not yet widely evident. Moreover, the number of jobs which can easily be tailored to meet individual preferences for work as against leisure may be limited in most industrial sectors.

Nevertheless, the idea of work and income sharing could prove to have a greater appeal to workers than general exhortations for more responsible wage behaviour because it offers solidarity with those threatened by lay-offs or already out of work.

The longer run

Looking beyond the current period of inflation-restrained growth, it can be argued that removing impediments to people's free choice between work and unpaid leisure would help solve not only the unemployment problem but also the formidable longer-term problem of restoring reasonable full employment without inflation:

● *First*, in most Member countries, under-utilisation of labour is more of a problem than under-utilisation of plant capacity, because there has been a long period of low investment. Reducing unemployment, partly through appropriate forms of work-sharing rather than by relying solely on general demand reflation, could help to prevent the emergence of capacity bottlenecks at an early stage of the upturn. Similarly, if shorter work hours were accompanied by more shift work leading to increased plant utilisation, more people could be employed without pushing up against capacity ceilings. Such advantages can, of

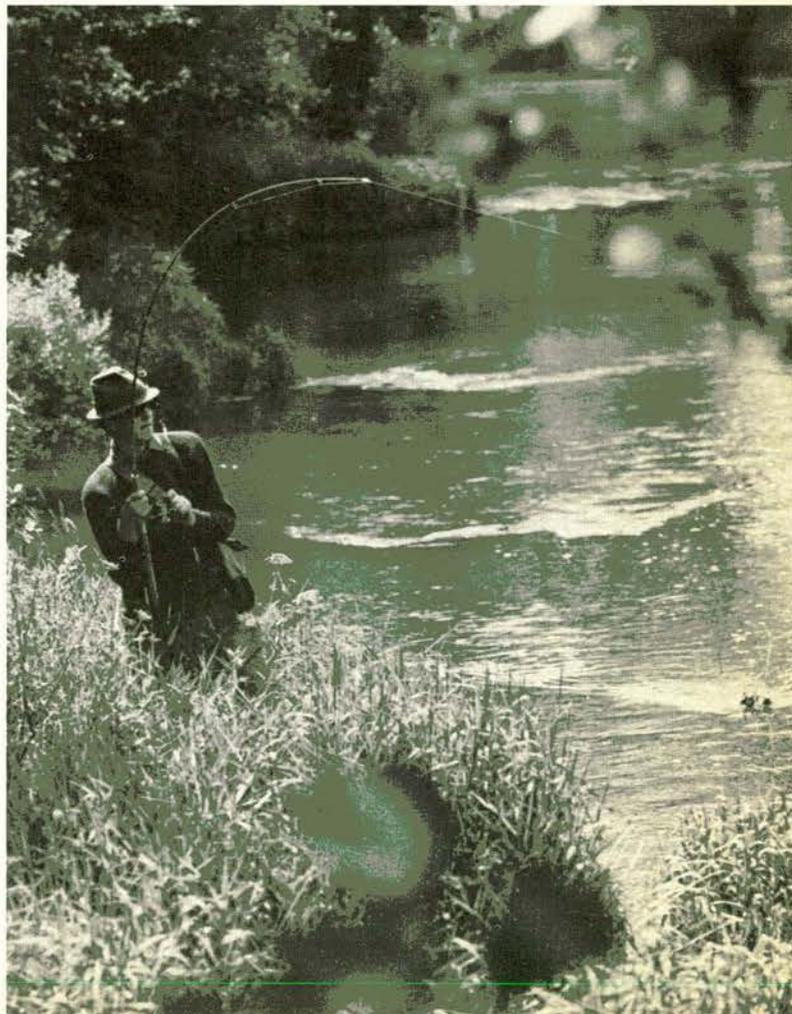
course, only be realised in firms whose products are in increasing demand and whose supply of labour is elastic.

● *Second*, attempts to absorb labour market slack fast by pushing up aggregate demand and raising the level of output will inevitably incur the risk of inflationary shocks due to raw material, and notably energy, shortages. Such risks would, of course, be less if employment opportunities were redistributed between those who are seeking jobs and those who prefer leisure. A given level of unemployment would then be reached at lower levels of output, hence lower energy and other resource requirements, and possibly less loss of real incomes to oil-producing countries on the part of OECD countries.

On the other hand, any success in reducing unemployment runs the risk of intensifying pressures in the labour market. The trade-off between unemployment and inflation would certainly be less critical if work-sharing were targeted to marginal or disadvantaged groups in the labour market.

The extent to which work-sharing can make a positive contribution to the unemployment-inflation problem depends heavily on the existence of a genuine trade-off between paid work and unpaid leisure. If people are not ready to accept income reduction (whether absolute or slower growth) in exchange for more leisure, attempts to stimulate work-sharing will be counter-productive from the employment point of view. The value of work-sharing devices must also be judged in the light of longer-term economic requirements. It is important to distinguish between short-term defensive measures and measures which are likely to be desirable (and non-coercive) in the longer run. The concept of positive adjustment, or adaptation, requires that the search for short-term policies should be conducted in the light of longer term structural needs — and that steps taken to cope with today's problems should, if necessary, be reversible.

"Removing impediments to people's free choice between work and unpaid leisure should help restore full employment without contributing to inflationary pressures... But if people are not ready to accept income reduction in exchange for more leisure, attempts to stimulate work sharing will be counter productive".





RECENT EXPERIENCE WITH INCOMES POLICIES

The labour market policies described in the previous article are designed to reduce unemployment without adding to inflationary pressures. Incomes policies, on the other hand, aim at bringing down inflation without increasing unemployment. An OECD study examines recent experience with these policies (1).

The study distinguishes between two types of incomes policy:

- a temporary policy directed towards “breaking” inflationary expectations by providing a supplement to demand management.
- permanent incomes policies aimed at resolving the problems of competing income claims by coordinating price and wage decisions within a macro-economic framework and improving the general level of public understanding. As examples of the latter, Austria and Norway are examined. In these countries, incomes policies are viewed within the broader context of the whole range of economic and social policies, and there is explicit recognition of the interdependence of wages and prices and thus also of the interdependence between firms and employees. In these countries incomes policies are institutionalised, but the study also examines the experience of other countries where informal arrangements prevail, and there is not necessarily an explicit incomes policy. Germany is an example. The temporary policies examined include those of the United States and the United Kingdom. The paper discusses the institutional framework, mandatory controls and tax and expenditure measures as well as the “re-entry” problem and concludes that, because firm evidence is hard to obtain, it is difficult to propose

anything much more definitive than an “open verdict” on the extent to which incomes policies can dampen inflation or supplement general demand management. While it is probably true that the impact of demand management on inflation is somewhat greater than a “pure” Phillips-curve analysis would suggest — particularly when exchange rate effects are taken into account — much depends on assumptions made with respect to the formation of inflationary expectations. Moreover, considering institutional and other differences, the relative importance of demand management and incomes policies is likely to vary considerably among countries. In some, dependence on demand management alone may impose intolerable political strains — especially as the incidence of stabilisation measures on the population is often very uneven. In addition, demand restriction may simply generate a disruptive reaction by organised labour, and may therefore not be politically feasible. In such circumstances, the case for incomes policy becomes the case against the alternatives and may be an essential ingredient to demonstrate that the burden of stabilisation is being more equally shared. These essentially political decisions will naturally be important in defining a role for incomes policy.

While past experience engenders considerable scepticism about the view that incomes policy — except, perhaps, in emergency situations — should play a *central* role, there are thus reasons for thinking that incomes policy can still play a useful, if limited, role within the context of global demand management. At the same time, if there is one lesson from past experience, it is that incomes policy should not be seen as a painless “quick-fix” for inflation. To succeed it must operate in conjunction with adequate monetary and fiscal policies. But within the general context of restrictive demand

management, incomes policy — even if only temporary — can, in principle, shorten the period of adjustment to a lower level of inflation and thus reduce the heavy costs of high unemployment.

How the authorities will go about securing acceptance of such an incomes policy will, of course, vary from country to country: in general, though, the recent innovation of using official taxation and expenditure policies explicitly to further incomes policy objectives is an interesting development. But the overriding need to maintain prudent fiscal policies will inevitably limit the scope of such policies.

If it is recognised that short-term incomes policies can be expected to play only a limited role in achieving a quick reduction of inflation, the longer-run need for some form of incomes policy, albeit implicit, will remain. While each group of workers may have an interest in pushing up its own wages, there is a general awareness in many countries that higher wages all round mean higher prices — leaving no-one better off. The longer-run task of incomes policy broadly defined is to ensure that this awareness is increasingly reflected in wage and price setting. This will involve the development of a better social consensus and, for many countries, reforms in the basic structure of collective bargaining. Neither will be achieved overnight. The task of such a longer-run incomes policy will be hard: the specific problems of wage and price determination in particular sectors will need to be explicitly addressed and not temporarily shelved as the authorities seek a quick reduction of inflation. Indeed, the very act of attempting to get a quick reduction of inflation may poison relations between the social partners and make longer-run policy impossible to implement. And, as so often in the past, the gains won by a temporarily “tough” incomes policy have disappeared as wages and prices rebounded once the constraint was removed. An OECD report in 1972, examining the Austrian experience of social partnership, concluded that: “A most important lesson is that if a tripartite approach to dealing with long-term problems is sought, it might be necessary to forgo the opportunity to obtain dramatic short-term gains which, by the very act of their securing, destroy the underlying goodwill and co-operation necessary for the establishment of tripartite bargaining.”

There seems little reason to change this conclusion now, the authors conclude. Failure to appreciate the inherent limitations of short-term incomes policies and the adoption of over-ambitious incomes policy targets, does nothing to favour the much needed development of wage and price-setting which is consistent with macro-economic targets over the longer term.

(1) *Incomes Policy in Theory and Practice* by Palle Schelde-Andersen and Philip Turner, published as an occasional study in the *OECD Economic Outlook*, July 1980.

INNOVATION POLICY IN OECD MEMBER COUNTRIES

Among the supply-side measures which can facilitate adaptation and help OECD countries return to more healthy long-term growth are policies to encourage innovation; and government support for innovation is an important constituent of the "Policies for Positive Adjustment" outlined by the OECD Ministerial meeting in 1978 (1). OECD governments have in fact been reviewing their domestic policies for research and development and have instituted a wide range of measures designed to encourage technological innovation. A high-level meeting, held recently under the chairmanship of Prof. A. A. Th. M. van Trier, Minister of Science Policy for the Netherlands, enabled governments to compare their innovation policies.

Invention alone does not make an innovation. To establish novelty in a process or product requires research and development, market studies, marketing opportunities and efficient management as well as the finance to put the steps together. Given the fact that in OECD countries most innovation in products and techniques takes place in the private sector, how can governments fortify the process? Essentially through three broad classes of measures: financial aid, promotion of "technical culture" and measures to maintain or stimulate competition between enterprises.

Member countries are at various stages in the implementation of these policies: some are still at the stage of study or development (Sweden, Ireland); others are currently implementing a number of them (the United States, see inset, France, Netherlands, Germany); Japan seems in a class by itself, having consciously implemented innovation policies since World War Two.

Financial Aid

The financial instruments used by governments to promote innovation include: ● direct aid for research and development ● tax incentives ● measures to stimulate risk capital.

Direct aid may consist of outright grants, normally limited to 50 per cent of the total project cost; subsidies repayable if the project is commercially successful; loans and bank-loan guarantees.

Until the late 1950s, direct government aid supported only major programmes for the development of military, aerospace and nuclear technologies. The orientation of public awards broadened during the Sixties and Seventies to include computers, telecommunications and health. Additional and smaller subsidies have also been used for individual industrial R & D projects in electronics, engineering and chemicals, especially when the work involves co-ordination with universities or public laboratories.

Traditionally, however, the lion's share of public aid has gone to the very large firms. The percentage awarded to small and medium-sized enterprises has tended to be grossly out of proportion with the latter's share of national employment and technological innovation. The major reasons for this distribution pattern seem to be fear of risk on the part of governments and the fact that smaller companies may be less well equipped than larger ones to deal with bureaucratic procedures.

In the last two or three years, many countries have introduced measures designed to help research funds percolate down to smaller firms. Such policies include the decentralisation of the awarding process; special programmes for small innovating firms or individual inventors; partial subsidies for R & D contracts that small firms may have with other companies or public or university laboratories; collective research centres and even subsidies for

some of the R & D personnel costs. Such measures have substantially helped increase the share of public funds allocated to the smaller firms.

Tax Treatment: Most OECD countries provide a partial or full allowance for R & D expenditure against taxes. In addition, many countries offer tax relief and depreciation facilities for purchases of plant and equipment, buildings and even land. The arrangements are complex and varied.

Provision of Risk Capital: Obtaining venture capital is a problem throughout the OECD community. United States data indicate that potential investors perceive a new company's probability of failure to be much higher than it actually is if the new company is in a field — such as high-technology — unfamiliar to the investor. Governments have intervened by:

- setting up public finance corporations. (These corporations generally take equity or provide loans which are convertible into share capital.) But oddly enough, the impression prevails that not all the government funding available through these means is being used.
- guaranteeing bank loans for innovation projects and the setting-up of new innovating firms.

Towards a Technical Culture

As important as financing may be, many authorities feel that a society cannot continue to produce successful technological innovation unless its people are familiar and comfortable with technology and cultivate an innovative spirit. At best, there would be a general "democratisation" of technology; at the least, channels organized for the dissemination of technological information to firms and individuals who would make direct use of it.

Innovation may depend not so much on new discoveries but on better dissemination and use of existing knowledge. For instance, there exist thousands of kinds of glue, some of which, while designed for specific uses in aerospace or construction, might "make waves" in shoe or furniture production. But of course, manufacturers of the latter must have a way of finding out about them.

Government efforts in the domain of technical culture have concentrated on encouraging cooperative research projects and university-industry linkages; organising programmes of technical assistance, especially for smaller firms; and creating data banks and communication networks.

Cooperative research programmes generally enable firms, particularly small ones, to study technological problems which would not normally be pursued by either university or large firms' research laboratories. When set up by firms themselves, they may be partly supported by public funds, as in Italy and Germany; through contractual subsidies for specific projects, as in the United Kingdom, or through a levy on firms, as in France's "Centres Techniques Industriels". Subsidised cooperative research also

(1) See *OECD Observer*, No. 93, July 1978, also *Policies for Innovation in the Service Sector, 1977, Policies for the Stimulation of Industrial Innovation, 1978, "Technical Change and Economic Policy" OECD 1980 and the article on the same subject in the OECD Observer No. 104, May 1980. An ad hoc group of OECD's Science and Technology Policy Committee is completing a two-year study on innovation in small and medium-sized businesses. The work of this group, and notably an inventory of government policies in favour of innovation in small and medium-sized businesses, was presented to the meeting. This article is based in part on the preliminary documentation prepared by the ad hoc group.*

takes place under the aegis of private or peri-academic foundations (especially in Denmark and Germany). In some cases (Canada and a programme planned in the U.S.) public funds for cooperative industrial research centres may be gradually withdrawn as the centres become self-financing. In certain countries, public laboratories have been set up to serve industry: Japan's system, with 200 laboratories at prefectural level, is the most extensive.

Various government programmes link university researchers with industry. Technical assistance, traditionally associated with cooperative research, has also been extended in a variety of programmes such as Belgium's Technological Guidance Centers and an extensive French programme for "regionalising" technology.

As to more general diffusion of technology, several governments sponsor yearly innovation fairs and exhibitions (in other countries industry sponsors this kind of event). Many countries have introduced programmes to help computer and micro-electronic technologies in small and medium-sized enterprises. The United States and the United Kingdom are among the countries having set up special high-level university training programmes for innovators; certain countries have focussed on improving technical training, Japan providing the most extensive technical training scheme. Finally, a variety of efforts are taking place in schools and para-educational systems to stimulate understanding of technology as well as the development of creativity.

Conditions of Competition

Most authorities on innovation agree that a fair amount of competition is essential for inventiveness. Competition policy includes anti-trust measures, public procurement programmes, patents and licensing, and regulations on products and services.

Anti-trust legislation, relatively unchanged for many years, remains the basic framework for stimulating competition. But, as in many other areas of innovation policy, the precise effects of anti-trust measures are not well known and surprises crop up: monopolistic enterprises may innovate continuously; firms in sectors of low concentration may stagnate. A degree of concentration that is optimum for incubating creative behaviour has yet to be discovered.

Public procurement — an often profitable market — seems to incite inventiveness where orders are large, regularly renewed and directed towards high-performance technologies. Over recent years, efforts have been made to cut red tape and step up publicity campaigns to provide fairer access to public procurement for smaller firms.

Patent and licence schemes to protect inventors' rights were probably the earliest government measures to encourage innovation. Recently, however, most countries' patent systems have been overhauled with a view to making patented inventions more accessible to potential users.

The effects of **regulation** are somewhat controversial. While some authorities feel that regulations — especially those requiring extensive testing of a new product — may hamper the creative spirit, others point to cases like Detroit, where pollution-control legislation stimulated positive innovation. Performance specifications are increasingly considered more desirable than product requirements. Finally, the trend towards de-regulation, of road and air transport, telecommunications and computer networks, in the U.S., for instance may well encourage an out-cropping of new ideas as competition becomes systematic in these fields.

The Problem of Evaluation

While considerable reflection and resources have been devoted

to developing instruments to encourage innovation, the fact remains that no one really knows how effective the various schemes may be. Furthermore, it is possible that some of them may work in one sector but not in another, or even within a sector in one country though not in another. As John Michael Ashworth, Chief Scientist of Britain's Central Policy Review Staff, mentioned, "We are in a sense doing much of what we do as an act of faith. We believe, and many politicians and large sections of our population are also convinced, that government innovation policy is a good thing, but *how* good a thing, and how much you should pay for this good thing is uncertain." One of the objectives for future work might be precisely to calculate the minimum critical intervention that could re-establish innovative trends.

To What End?

More basic issues lie behind the choice and effectiveness of policy instruments for innovation. Most fundamentally, innovation is not an end in itself but a means. Therefore, all sectors of society have a right to help determine the goals innovation should serve. Moreover, innovation means change: change in peoples' jobs, in the products they buy, in the way they organise their time; in the power structure of organisations and work-places. Since it is ultimately the consumer who will have to live with innovations — and pay for them — the public should have a voice in determining innovation policy.

The question of technical culture exemplifies the often volatile nature of innovation policy debates. Shigemichi Sonoyama, Director General of the Planning Bureau of the Science and Technology Agency of Japan, explains that Japanese policy aims to "establish a science and technology-oriented nation, through the development of basic science and original technologies." Others pose the question of whether, if a culture consists of the collective myths, legends, attitudes, language of a people, a ministry of industry should be allowed to tamper with it.

International Cooperation for Innovation

Although a country's technological innovativeness gives it a competitive edge on the world market, authorities stress that industrial competition should not be considered competition between nations. There is, in fact, wide scope for international cooperation on the development of innovation policies within the OECD community. Possible directions include:

- organising an "International Technical Research Who's Who": a directory of people and organisations performing technical research in Member countries.
- gathering and distributing studies on the effects of new technologies (such as one recently performed by the EEC and underway in OECD on micro-electronics and employment).
- pooling ideas on techniques for evaluating domestic innovation policies. Innovation policy might be chosen as a pilot field for assessment of science and technology policy measures more generally.

It has also been suggested that joint research on relatively non-competitive technologies be undertaken within an international framework such as that of OECD. Suitable areas for such cooperation might be non-trade public sectors such as waste disposal, resource recovery, mass transportation, municipal data processing; quasi-public programmes such as medical data systems, and private sector construction activities.

Implementing innovation policies is not without risk, either on the domestic or international scenes. But, in the words of Jordan Baruch, U.S. Assistant Secretary of Commerce for Productivity, Technology and Innovation, "If we can lose our chauvinistic pride, we will find that we can learn from each other to increase the effectiveness of our own firms. The world is really not a zero-sum game when it comes to technological change; one can literally get more without taking it away from somebody else."

AN EXAMPLE OF INNOVATION POLICIES : THE UNITED STATES

A major domestic policy review was conducted two years ago by the Secretary of Commerce and an advisory committee of 150 senior representatives of industry, the public interest, labour, and the scientific and academic communities. The findings and recommendations of the review led to the planning of a number of new programmes and reorganisation of older ones. The diverse policies will be coordinated by the Office of Productivity, Technology and Innovation (formerly the Office of Science and Technology). The programmes include :

Aid to Small Firms

Small, high technology firms are the source of a large number of innovations in the United States economy. Two Corporations for Innovation Development (CIDs) will be established in fiscal 1981 to provide small firms with start-up capital, early management assistance, and help in obtaining second-round financing.

Research and Technology Transfer

Several Cooperative Generic Technology Centers (COGENTs), non-profit and financed jointly by industry and government, will be established in 1981 at universities or other private sector sites. The centers will concentrate on technologies that underlie numerous industrial sectors: corrosion prevention, automated assembly, powder metal-

lurgy, tribology (the science of friction and wear) are examples of possible research subjects.

Innovation Centers, organised by the National Science Foundation, have been in operation since 1973. Established at major universities, the centres involve students in product design and launching as well as entrepreneurship. One of the results is the establishment of 24 firms, creating some 1,000 jobs, after four years of the centres' operation. (The Innovation Centers are expected to become financially independent after five years.)

A new Center for the Utilisation of Federal Technology (CUFT) is designed to be a "one-stop shopping center" for industrialists wishing information and assistance in using technology developed in federal laboratories. Previously, NASA, the space agency, was the only specialised agency to make a significant effort to publicize its research results. Their regional centers for technological transfer are consulted by 10,000 enterprises a year.

The National Technical Information Service is being expanded and will henceforth include technical data from other countries.

The Regulatory System

The Patent and Trademark Office. The filing and classification system of the Office's literally million patents will be modernised to facilitate public access as

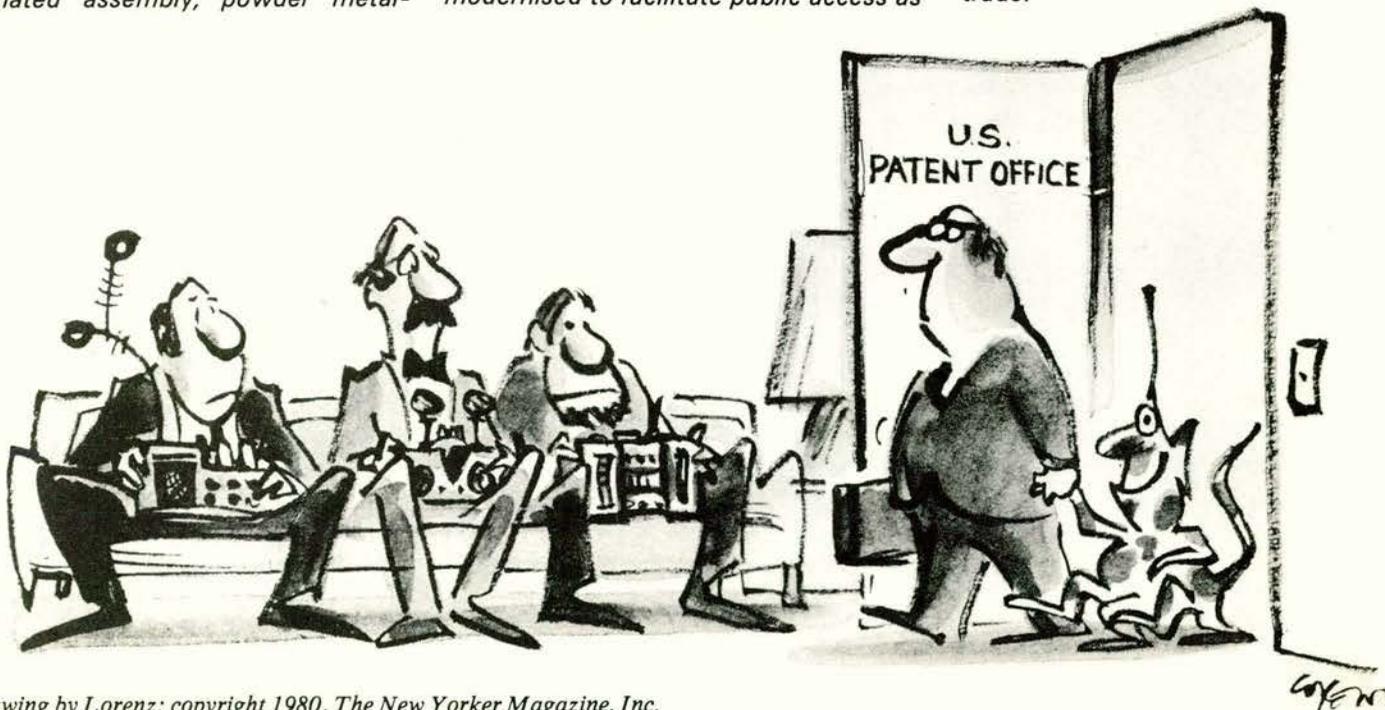
well as patent litigation. The Small Business Administration will establish an office to assist small firms in dealing with patent procedures; the Office of Minority Business Enterprises will establish a parallel body. Finally, rights to licences by contractors performing federal agency-sponsored work will no longer be exclusive across the board but only in certain fields of use.

Federal regulatory agencies have been asked to develop five-year forecasts of proposed regulations to help industry develop technologies that comply with environmental, health and safety regulations.

"Economic" regulations of certain industries are being eased to stimulate competition. Civil aviation and road transport are undergoing de-regulation, and telecommunications and computer networks probably will.

Other Activities to Support Innovation

- A labour/technology forecasting system is being created to predict changes in technology and assess their implications for labour.
- Federal authorities will host a conference of deans of business and engineering schools to develop improved curricula in entrepreneurship and technology management.
- Trade policy is being reorganised to promote domestic and international trade.



drawing by Lorenz; copyright 1980, The New Yorker Magazine, Inc.

THE FOOD INDUSTRY

Innovation and Industrial Structure

Food manufacturing, though traditionally considered an adjunct to agriculture, is the leading industry in OECD Member nations, contributing even more to the value of industrial production than the transport equipment industry. A recent OECD study examines how technological innovation has changed the structure of the food industry as well as the products found on supermarket shelves.

The study is the first major overview of food manufacturing in the OECD community and analyses the sector's links upstream with agriculture and downstream with distribution, the role played by product innovation and other R & D activities, and the central importance of the few large firms, especially multinational enterprises, in guiding the industry's evolution.

The food industry does all the processing, preparing and packaging of both food and animal feed. It would in fact be more accurate to say "industries" since the sector is far from homogeneous: cereals, milk, dairy products, meat, sea foods, fruits and vegetables grown in temperate as well as tropical regions, oils, sugar, tropically grown drinks (tea, coffee, cocoa), alcoholic beverages and soft drinks are among its range of products.

The diversity of the food industry is also reflected in the size of its firms: in most OECD Member nations, a few large multinational or national enterprises are flanked by medium-sized regional and small local companies, including in some countries one-man or craft businesses. The proportion of each type varies from country to country.

A "typical" large food firm could be described as one which gradually diversified into all the product lines of its original food sub-sector, then branched out into other sub-sectors and began integration and coordination upstream and downstream. Usually only after it is established on a national basis in its home country will a firm begin operations overseas.

Multinationality of food firms has not been as common as in other manufacturing sectors. Many of the world's 100 leading food enterprises have no foreign subsidiaries, and a further equally significant proportion have subsidiaries and plants in less than five countries and so are not technically considered multinational. (Table 1 shows the industry's top 15 MNEs.) There is, however, considerable foreign investment in the industry. A period of active American investment in Europe has been followed by recent heavy European and Canadian investments in the United States.

Food Manufacturing : Its Dominance in the Food Chain

Over the last twenty years, the relative economic importance of different parts of the food chain – agriculture, processing, preparation, packaging, distribution – have changed considerably. To give an indication of the magnitude of the food processing sector, food industries in the United States bought 66 per cent of total American farm production in 1975. All but 9 per cent of the food sold by

1. THE FIFTEEN LEADING FOOD FIRMS

rank-ordered by 1976 food sales

Rank	Parent Company	Home Country	Food Processing Revenue (\$ US million)	Total Revenue		Net Income		Total Assets	
				Amount (\$ US million)	Proportion Foreign (%)	Amount (\$ US million)	Proportion Foreign (%)	Amount (\$ US million)	Proportion Foreign (%)
1.	Unilever Ltd.	Neth/UK	8,741.2	17,638.4	40.0	1,276.8	51.0	5,977.8	35.9
2.	Nestlé Alimentana S.A.	Switzerland	6,247.8	7,247.8	95.0	n.a.	n.a.	2,693.0	n.a.
3.	Kraft Inc.	US	4,775.8	4,977.0	15.1	135.7	n.a.	1,016.0	n.a.
4.	General Foods Corp.	US	4,401.6	4,910.0	25.8	127.3	15.3	1,085.0	28.0
5.	Esmark Inc.	US	3,955.2	5,300.6	16.0	82.6	14.4	710.6	17.2
6.	Beatrice Foods Co.	US	3,943.0	5,289.0	21.2	182.8	19.9	1,158.0	27.3
7.	Coca-Cola Co. Inc.	US	2,911.5	3,032.8	44.0	285.0	55.0	1,356.5	37.0
8.	Greyhound Corp.	US	2,384.9	3,738.1	n.a.	77.1	n.a.	652.3	n.a.
9.	Ralston Purina Co.	US	2,365.5	3,393.8	24.4	125.9	13.9	765.5	13.8
10.	Borden Inc.	US	2,336.3	3,381.1	16.0	260.5	20.0	938.2	16.7
11.	United Brands Co.	US	2,130.4	2,276.6	25.6	16.3	n.a.	499.0	68.6
12.	Iowa Beef Processors Inc.	US	2,077.2	2,077.2	–	26.8	n.a.	134.3	–
13.	Imperial Group Ltd.	UK	2,070.5	5,789.9	11.7	132.1	n.a.	1,485.5	n.a.
14.	Archer - Daniels - Midland Co.	US	2,065.5	2,118.5	26.7	61.4	n.a.	415.4	n.a.
15.	Pepsico Inc.	US	2,051.2	2,727.6	20.8	136.0	15.0	753.0	22.3

Source: United Nations Centre of Transnational Corporations.

American supermarkets had first been bought (or produced) and processed by a food firm. Although more highly developed in the United States, the trend for food processing to dominate agriculture is clear elsewhere as well.

Technological advances and shifts in patterns of consumption, as well as the size of the processing industry and the large food firm's capacity for vertical integration and co-ordination, account for this shift of dominance. Since mass production technologies have made possible the continuous processing of homogeneous food products, firms need to secure standardised, often tailor-made raw materials. So large firms, to ensure the quantity and specifications of their supply, have increasingly invested in agriculture or, more commonly, fixed contractual relations with farmers.

Technological innovations from chemicals and pharmaceuticals, as well as engineering, are also contributing to the change in status of the links in the food chain. One of the most decisive trends is that an increasing number of basic crops produced on the farm are no longer viewed as finished or even semi-finished products, but rather valued for their components: what kinds of sugars, starches, fats and proteins they yield when broken down, or "fractionated". Using highly sophisticated chemical engineering techniques, foods' constituents can now be isolated and restructured at the molecular level to improve or change their properties.

Primary processing firms can produce purified and stabilised intermediate food products (flours, concentrates, isolates, syrups, acids, flavorings etc.) with well-defined technological and nutritional properties. Firms downstream, released from direct dependence on agricultural supply, reconstitute the often interchangeable elements into consumer products. Agriculture, rather than remaining distinct from industry, has increasingly become simply the link in the industrial food chain that provides the substrata for primary processing.

The Growth of the Industry

Although the food industry is large, it has been growing more slowly than the manufacturing sector as a whole. This is not surprising, since per capita calorie intake in OECD countries is near saturation. Still, rise in demand for processed food has been exceeding that for food in general. The OECD community's rural-to-urban migration (which means that fewer households produce their own food), the development of distribution and, especially, changes in women's roles have helped the industry grow. In fact most successful "new" products have really just been "old" ones presented in a more convenient form (frozen, "instant", pre-mixed, pre-cooked, oven-ready, ready-to-eat, bite-sized, in individual portion packets). Thus much of the actual, though unrecorded, value added of the domestic work of housewives has been transferred to the food industries.

By now, according to the OECD study, the social trends encouraging food industry growth have probably peaked as far as their effect on the industry is concerned. However, since most international trade in processed food products occurs between developed countries, the study does not predict stepped-up exports to the Third World in the foreseeable future. Instead, the large food firms may increasingly turn their attention to creating non-food items from agricultural raw materials.

Organisation of Research and Technology

The OECD report describes the structure of research and the state of knowledge of food manufacturing in Member countries, with attention to the share of these capacities held by private industry. While the overall intensity of industry financed R & D is quite low, the pattern of expenditure by firms on R & D well reflects the structural tendencies of the food industry, such as concentration and vertical and

horizontal expansion, as well as the predominant emphasis on product proliferation. Furthermore, many of the most important innovations are results of transfers of technology from other industries, especially the chemical and pharmaceutical, mechanical and electrical engineering, and packaging materials sectors.

The majority of firms do not perform their own R & D, relying for

2. SOME NEW FOOD PRODUCTS

Products introduced during 1945-1965 (1)

Vitamin-enriched breakfast cereals
 Breakfast cereals with freeze-dried fruits
 Instant oatmeal
 Dehydrated flaked potatoes
 Instant-blending flour
 Frozen dinners and specialties
 Dehydrated potato specialties
 Synthetic orange drink concentrate
 Orange juice concentrate
 Boil-in-bag frozen vegetables
 Liquid diet foods
 Polyunsaturated (corn oil) margarines
 Soft margarine
 Unsalted, frozen margarine
 Instant dessert & pudding mixes
 Precooked rice
 Packaged rice specialties
 Extruded dry pet foods
 Semimoist meat pet foods
 Vegetable-oil coffee lighteners
 Dry salad dressing mixes
 Freeze-dried soluble coffee

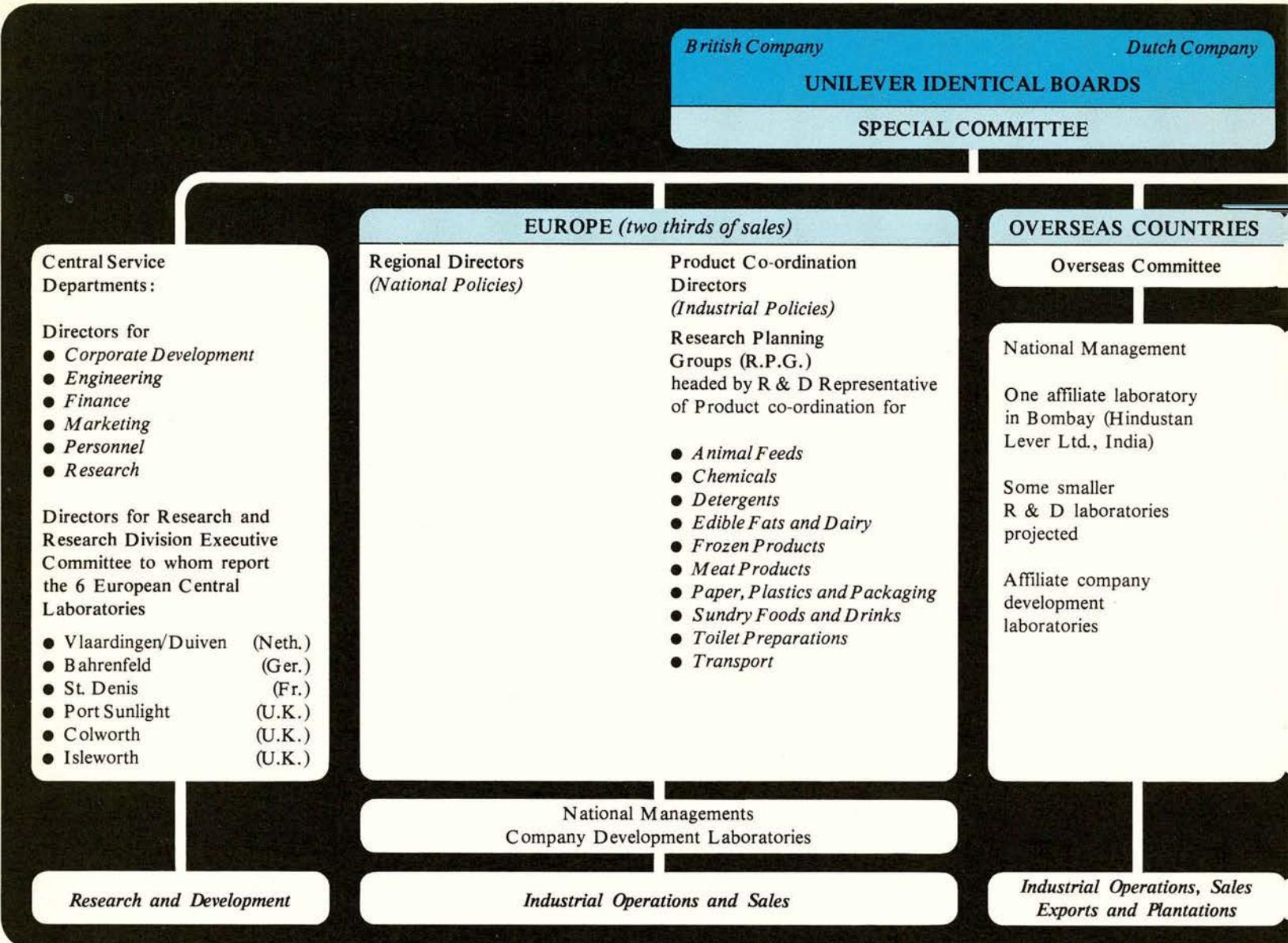
Products introduced circa 1978 (2)

Microwave-compatible pancakes
 Cough candy lollipops
 Sangria-flavoured soft drink
 Quarter-pound hot dog
 Turkey kielbasa sausage
 Pizza-flavoured sticks
 Yogurt bran bread
 100 % fat-free candy
 Soft drink concentrate in aerosol can
 Kosher bubble gum balls
 Frozen yogurt bars
 Spoonable cheese spread
 Canned egg custard
 Flavoured grits
 Powdered Worcester sauce
 Jalapeno pepper jelly
 Honey jelly
 Carbonated soft drink powder
 Smoke-flavoured salt
 Aseptically packaged milk
 Rice bread
 Fructose sweeteners
 Frozen quiche
 Powdered isotonic beverage mix
 Powdered cocktail mix
 Pre-moulded cranberry jelly

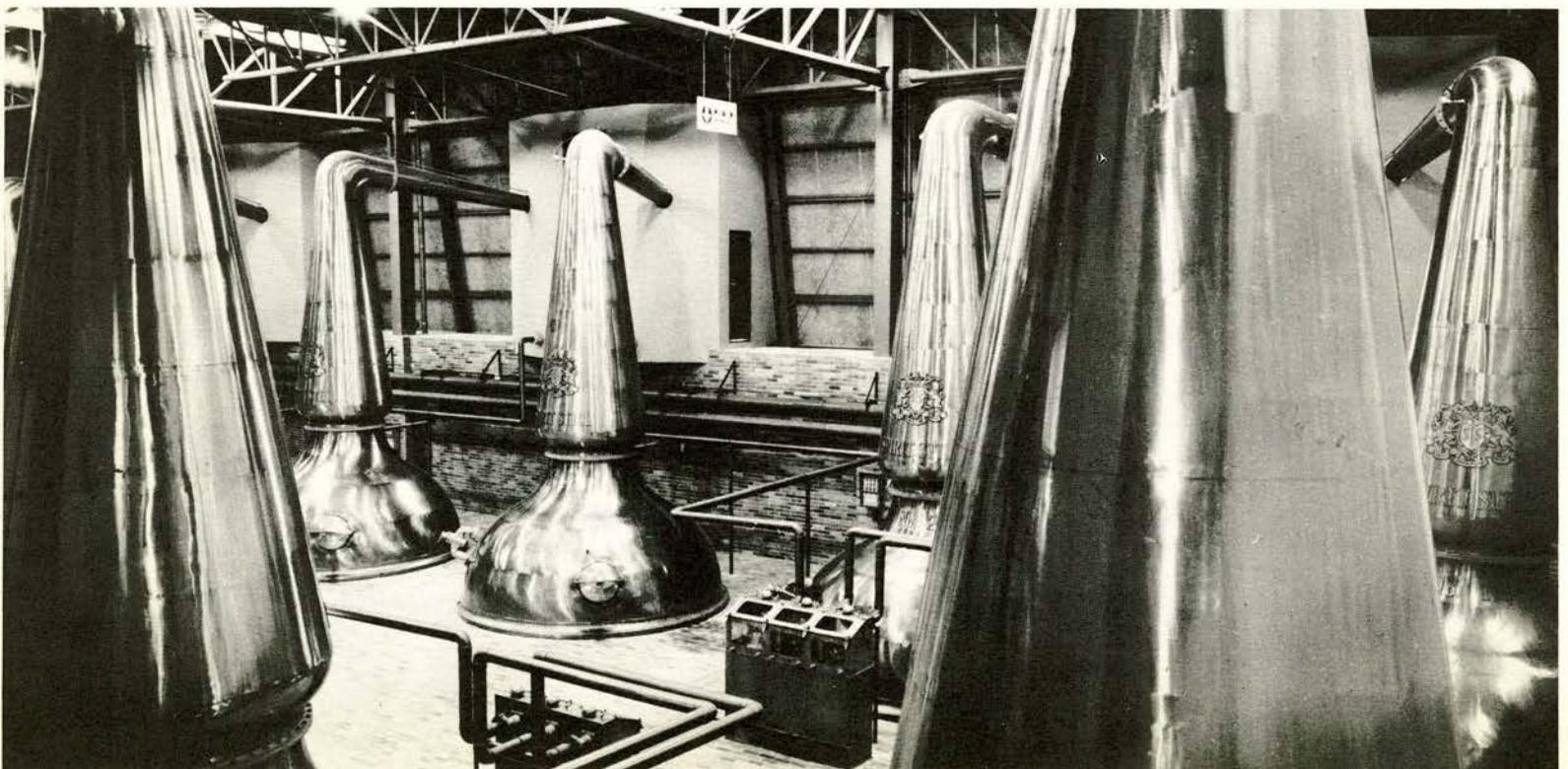
(1) Selected by R.D. Buzzell and R.E.M. Nourse in Product Innovation in Food Processing as "substantially different in form, technology, or ingredients..."

(2) Selected by the editors of Progressive Grocer as being especially "ingenious, innovative, and intriguing".

A. R & D WITHIN UNILEVER CORPORATE STRUCTURE



Source : Unilever Ltd., London.



NORTH AMERICA

Two affiliate laboratories

Edgewater (N.J.)
run by Lever Brothers Co.,
U.S.A.
and
Englewood Cliffs (N.J.)
run by Thomas Lipton,
U.S.A.

United Africa Co.
International

Industrial Operations
and Sales

Commercial and Industrial
Operations
chiefly Overseas and Exports

technological advances on help from their equipment, plant and intermediate chemical suppliers and on ideas that may originate in the laboratories of the large firms. In the United States in 1976, 36 firms accounted for at least 90 percent of the total American industrial food research expenditure of \$ 301.9 million. The two major European firms, Unilever and Nestlé, are estimated to make higher outlays for R & D than their counterparts.

The food industries have reaped substantial rewards from public research on pesticides, fertilizers and genetics aimed at improving agricultural produce and productivity, as well as from medical research and study of environmental problems. Outside the United States, however — where substantial efforts in the field of new food processing technologies have been backed by the Departments of Agriculture and Defence (in the Natick laboratory) — there is generally little government involvement in food processing R & D.

By no means all firms, even the largest, have an R & D department, but all have highly sophisticated engineering departments to deal with the increasing use of continuous processing and to help transfer technology from other industries.

As soon as big firms attach importance to — and spend large sums on — science and technology, R & D becomes an integral part of overall company decision-making at top-management level and calls for quite highly centralised forms of programme definition, co-ordination and research control (chart A gives an example of how R & D is organised.)

R & D activities tend to cover the complete food chain (or chains) along which the firm has been established. The indivisibility of certain food problems leads R & D laboratories to anticipate or prolong any vertical integration or co-ordination policies on production followed by firms upstream and downstream. Thus, even where large firms do not own crop or animal farms, they may nevertheless include agricultural projects in their R & D activities. Downstream, they may perform the marketing research that helps them guide their product development efforts.

A further facet of food research and development in companies with multinational development is the marked centralisation of R & D in the home country. Host country laboratories almost always function as “support labs”; they may, for instance, adapt products to the tastes and production conditions of the host country. This may also be the case in the experimental agricultural research stations established by large multinationals in their overseas subsidiaries.

Research and Technology : What is “New”?

The major thrust of R & D programmes by large food firms appears to be changing. In the 1950s and '60s, “product innovation” took top priority and may have accounted for as much as 80-90 percent of R & D expenditure in the United States. However, the vast majority of the thousands of items marketed as “new” owed their novelty only to a new brand name, changes in packaging or flavour, or other minor variations. Furthermore, products were created at a tremendous cost, even though only about 55 out of 1,000 new items tested actually reached the production and marketing stage, and those chosen few usually lost money for at least the first two years. In addition, vast amounts of advertising are required in such a system of competition through product proliferation. In both the United States and the United Kingdom, food firms rank among the top advertisers.

Currently, however, many industry representatives agree that product innovation has gone as far as it can for the moment. In addition, organised consumer groups have been protesting the concept of product proliferation, and nutritional criteria are beginning to have more effect on government actions.

Not that this means the end of research into foods. On the contrary, progress is underway on all facets of the food chain, and in-



A computer controlled distillery and a mini fermentor for food research, both in Japan.

novations in one branch continue to facilitate or call for changes in another. In agriculture, for instance, genetic advances have led to the production of corn with a higher content of specifically desired organic compounds: thus it becomes more profitable to fractionate the corn to obtain components for food products. Genetic engineering techniques now permit the development of selected characteristics in the lab, bypassing lengthy selective breeding. Other agricultural research (see page 24) involves the use of catalysts to induce nitrogen-fixation in corn and other plants that do not fix nitrogen by themselves; some of the economic and pollution problems that go with the current nitrogen fertilizers could thus be avoided.

Work is also in progress on preservation and packaging techniques. For instance, deep-freezing by spraying with liquid nitrogen has been found to have the advantages of a quick temperature drop to as low as -40 to -50°C without oxidation or dehydration. Irradiation, which is at the commercial stage in some countries, can destroy decay-

producing microbes in agricultural products without heating them (1); so far it is being used on potatoes and other tubers, in which it also prevents germination, and in some fruits.

New processing and preservation technologies (as well as marketing strategies) have in turn demanded new means of packaging and distribution. Major recent innovations include packaging constructed of various combinations of aluminium foil, plastic film or foil, cardboard (which today is really board coated with polyethylene or wax), hollow ware packaging and PVC bottles. Various of these combinations can be placed in a normal or microwave oven, substitute for canning, or be used as a plate.

Other new developments have implications far beyond the food sector (see below).

(1) OECD's Nuclear Energy Agency sponsors, with other international agencies and 24 participating countries, research in this field through the International Project on Food Irradiation

BIO-INDUSTRIALISATION

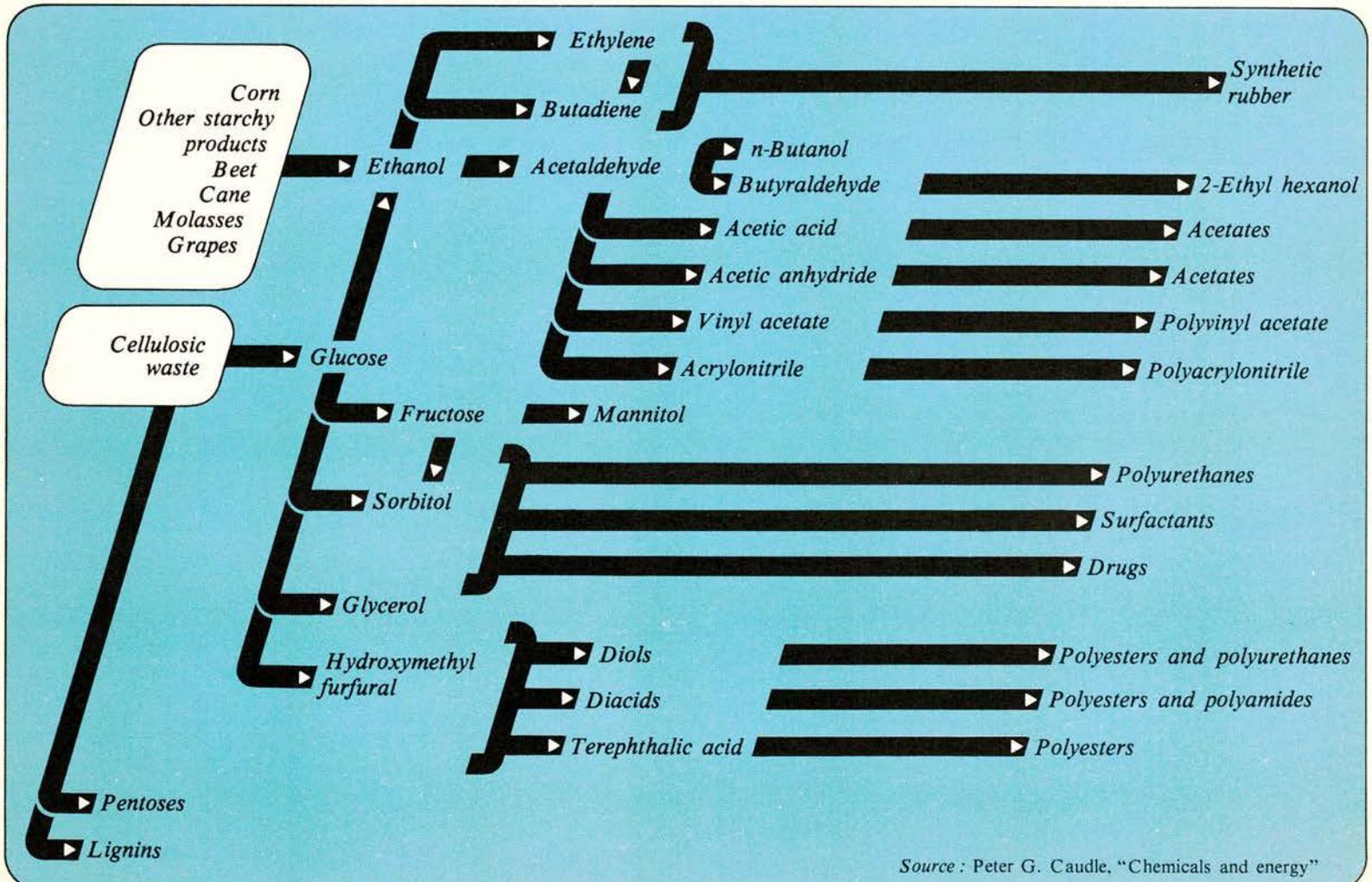
According to the OECD report, one of the most important trends among food firms is the emergence of what may be called "bio-industry" which, however, goes well beyond the food industry itself. Bio-industrial processes aim at the systematic, economic exploitation of reproducible plant and animal biomass not only for food but also as substrata for the chemicals and pharmaceuticals industry, and the bases for cheap, renewable sources of energy. The biomass in question is composed of farm produce as well as currently unused materials such as straw, whey, animal and domestic waste, fruit and vegetable

peels, tree leaves and algae as well as industrial by-products. The raw materials are turned into usable products by, among other processes, industrial microbiology and enzymology. Chart B indicates some of the transformations involved in bio-industry.

Industrial Microbiology

The role of micro-organisms in producing fermented foods and beverages is of course well known. Newer uses for micro-organisms include the synthesis of organic compounds: proteins, enzymes for

B. BIO-INDUSTRY : CHEMICALS FROM CROPS



Source : Peter G. Caudle, "Chemicals and energy"

3. APPLICATION OF MAJOR ENZYMES, AND THEIR SOURCES

<i>Enzymes</i>	<i>Application</i>	<i>Source</i>
Amylases	Processing of starch to manufacture dextrin, paste, malt sugar, glucose, etc. Removal of starch, desizing of textiles, etc. To saccharify fermentation materials in alcohol industry, brewing beer, sake, etc. Digestants Others: manufacture of syrup for confectionery use, prevention of staling of bread, processing of feeds, manufacture of elasticizers, glycerides, digestant	Bacteria, malt, fungi Bacteria Bacteria, fungi, malt Pancreas, bacteria, fungi, malt Bacteria, fungi
Proteases	Coagulation of milk and maturing in cheese fermentation Manufacture of miso, soy sauce and amino-acid seasonings Depilation and bating in leather industry Removal of protein clouds in brewing industry Digestive and anti-inflammatory drugs Others: recovery of silver from photo film, softening of meat, elasticizers	Rennin, fungi, lactobacilli Bacteria, aspergilli Pancreas, bacteria Papain Pancreas, fungi, bacteria, <i>Streptomyces</i> , bromelain, papain
Lipase	Manufacture of butter flavour and glycerides; digestants	Fungi, pancreas
Pectic enzymes	Clarifying of fruit juices and wine	Fungi
Hemicellulase, cellulase	Processing of grains and vegetables; extraction of plant ingredients, digestant	Fungi
Inulinase	Manufacture of fructose	Bacteria, fungi
Hyaluronidase	Drug ("spreading" factor)	Bacteria
Invertase	Manufacture of invert sugar	Yeast, bacteria
Naringinase	Removal of bitterness in fruit juice	Fungi
Hesperiginase	Prevention of clouds in canned mandarins	Fungi
Anthocyanase	Decolouration of fruit juice	Fungi
Acylase	Manufacture of amino acid	Fungi
Tannase	Removal of astringency, purification of enzymes	Fungi
DNase	Drugs	Bacteria
Ribonucleotidase	Manufacture of inosinic acid	Fungi
Deodourizing enzyme	De-odourizing of beans, removal of cooked flavour	Fungi
Glucose oxidase	Antisepsis of foods (removal of oxygen), manufacture of dehydrated eggs (removal of glucose), glucose assay	Fungi
Catalase	Antisepsis of foods (combined with glucose oxidase)	Fungi
Uricase	Decomposing of uric acid, uric acid assay	Yeast, <i>Streptomyces</i>
Aspartase	Manufacture of aspartic acid from fumaric acid	Bacteria
Fumarase	Manufacture of malic acid	Bacteria
Glucose isomerase	Manufacture of fructose from glucose	Bacteria, <i>Streptomyces</i>

Source: Japanese Society of Fermentation Technology.

fractionating (see next section), antibiotics. High-performance bacterial strains can now be developed not only by selection and mutation, but also by the injection of genes from other uni- or multi-celled organisms (recombinant DNA). Instructions coded in the genes essentially turn the bacteria into tiny factories for desired products. It has thus become theoretically possible to bio-manufacture an infinite range of substances from biological pesticides to growth hormones which could otherwise be obtained only by complex and expensive chemical synthesis, if at all.

Industrial Enzymology

Enzymes are used in bio-industry mainly for fractionating, synthesis and transformation processes and the control of aromas and flavours. Traditionally extracted from animal organs and plants (pine-apple and papaya), enzymes can now be grown by bacteria (see above), selected yeasts and fungi. They must be extracted, purified and used under carefully controlled conditions. Table 3 shows some sources and uses of the major enzymes.

NEW TOOLS FOR A NEW AGRICULTURE

by Roger Marcellin,

Head of Project of Co-operative Research, OECD Directorate for Food, Agriculture and Fisheries

Two of the most serious problems for the not too distant future are the threat of a world food shortage and the depletion of conventional energy resources. For agricultural authorities these two problems raise a vital question — how to promote a new, more productive type of agriculture capable of meeting the needs of a growing world population while making more sparing use of nonrenewable sources of energy.

This issue has been chosen by the directors of agricultural research of OECD countries as the subject of a co-operative research project on food production and preservation (1). The following article discusses the new agricultural paths opened to agriculture by this research work.

The world food shortage and the depletion of energy resources are in fact two facets of the same problem. Essentially, of course, food is energy — the energy required by every organism to sustain life and to carry out work including the production or acquisition of its own food. To say that an adult human being needs 2000 calories a day to subsist also means that he must be provided with 2400 watts per hour each day. Hence, from the point of view of energy, a human being can be compared to a small 100-watt bulb kept perpetually alight.

Over 90 per cent of the energy required for human life is still produced by agriculture, which may be defined as the set of "precautions" taken by man so that certain plants can, under the best conditions, take advantage of their capacity to store in chemical form the solar energy they receive.

However, if agriculture is to nourish a population considerably larger than at present, it will be necessary to do so without massive recourse to production factors (fertilizer, pesticides, machines, drying or cooling systems) which require fossil fuels and in particular oil. These apparently contradictory aims can only be obtained through a great effort of research and applied innovation.

A New Research Effort

The OECD project consists of four subjects. One focusses on fixation of solar energy by plant life (*improving the efficiency of photosynthesis to promote better use of solar energy*). The three others aim at diminishing waste of energy and agricultural products: *improvement of biological nitrogen fixation for plant production; direct use or transformation of cellulose and other carbohydrate wastes for human and animal food and protection of crops against contamination by mycotoxins.*

Each of these major research subjects, briefly outlined below, opens up prospects for a type of agriculture adapted to future needs.

Improving the efficiency of photosynthesis

The dangers of population growth coupled with the increasing scarcity of certain natural resources, including energy, reflect events that took place two or three billion years ago: the first living organisms that proliferated a few feet below the water's surface, feeding on organic compounds produced outside the life cycle (using these compounds to produce their own source of energy by fermentation) threatened to die out because their primal broth was thinning out. The emergence of new beings — autotrophs — provided with

chlorophyll and able, through photosynthesis, to produce their own organic matter, in particular glucose from carbon dioxide, water and solar energy — saved the situation and enabled life as we know it to develop. However, by producing oxygen, photosynthesis enabled a new function to be created some two billion years ago, respiration (a sort of photosynthesis in reverse), which uses glucose to produce energy, the yield being nineteen times that of the older fermentation process.

Photosynthesis is therefore the source of plant and animal life on earth, and it is a surprising fact that comparatively limited resources should so far have been devoted to research on the subject.

The economic importance of photosynthesis is obvious from the following few figures:

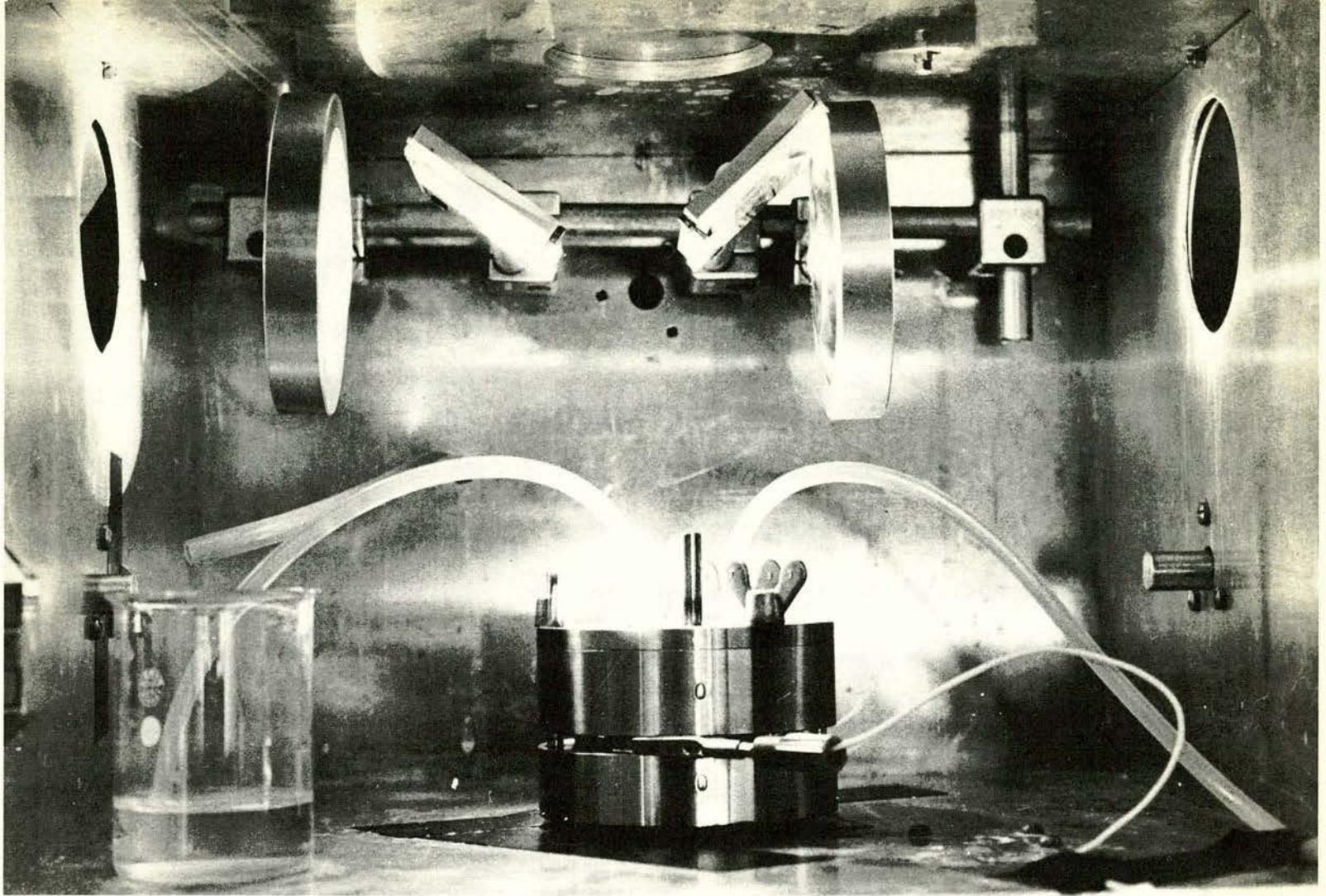
- The amount of carbon fixed each year by autotrophic plants in biomass (or more accurately phytomass) form is some 200 billion tonnes (3×10^{21} joules) or approximately ten times the energy equivalent used yearly in the world. Of these 200 billion tonnes, 800 million (13×10^{18} joules) are used to feed the human population, i.e. 0.4 per cent.
- Yet the efficiency of photosynthesis, expressed as the ratio between chemical energy fixed by plants and the energy contained in the light rays falling on the plants (9×10^{23} joules) is less than 1 per cent.

Such a low efficiency rate should be capable of improvement. Even a small increase would have spectacular effects, in view of the scale of the process involved.

This is a difficult undertaking, and what has been defined as "photosynthesis efficiency" is actually a measurement of the effectiveness provided by a complex set of related processes both within the plant (chlorophyll absorption, translocation and consumption of the energy required for the plant's different vital functions, etc.) and outside (effectiveness of the plant cover in terms of time and space), each having a different degree of efficiency. Thus such an extremely subtle process as photochemical reaction, whereby the plant produces glucose from carbon dioxide, has a high energy yield when considered separately (some 30 per cent). While it would be utopian to expect that the operation of this mechanism could be improved in the short term, it might be possible through better knowledge to increase the protein, fat and sugar content of plants and hence the nutritional value of the agricultural production.

The complexity of the problem explains why OECD's

(1) Fourteen countries currently participate in the project: Belgium, Canada, Finland, Germany, Ireland, Netherlands, New Zealand, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States and Yugoslavia.



The efficiency of photosynthesis can be increased through complex and complementary research approaches which focus on the cell, the plant and the cultivated field. Above : Apparatus for measuring the rate of photosynthesis in the laboratory.

photosynthesis project has no less than twenty research topics, grouped in three broad sub-programmes: the study of photosynthesis from the stand-point of the photosynthesising organs (chloroplasts), the whole plant, and the cultivated field. Groups of volunteer laboratories, flexibly co-ordinated, carry out research on each of the twenty themes. Research agreements are harmonised as far as possible in accordance with the specific interests of each laboratory, and the same materials are used (wheat seeds, maize, etc.) in each, for purposes of comparison.

Biological nitrogen fixation

Most plants are unable to draw the nitrogen they need directly from the air to build their own tissues, and in particular proteins, and must therefore obtain it in combined form (ammonia but especially nitrates) from the ground. Hence they depend entirely either on fertilizers or on bacteria capable of fixing nitrogen from the atmosphere. These bacteria, which live freely in the soil or are found in the roots of certain plants (mainly legumes) fix some 150 million tonnes of atmospheric nitrogen a year using energy extracted from organic matter in the soil (free-living bacteria) or that produced by the host plant (symbiotic bacteria). These latter are the more valuable for man in that leguminous plants play such an important role in human and animal food. The bacteria (rhizobia), which live in association with legumes, alone fix from 50 to 60 million tonnes of nitrogen per year, or approximately the quantity utilised by world agriculture in the form of nitrogen fertilizers.

But the energy cost of producing nitrogen is extremely high — some 11,000 or 12,000 kcal per kg of fixed nitrogen or 1.15 tonnes of oil equivalent per tonne of nitrogen contained in synthetic ammonia. Such a country as the United Kingdom consumes, for the

manufacture of its nitrogen fertilizers alone, more than 80 per cent of the total energy used by its entire fertilizer industry. It may be noted that bacteria, while performing better than industrial methods in carrying out the same process, are still energy-intensive: they need from 5,000 to 10,000 kcal drawn from the carbon of organic matter in order to fix 1 kg of nitrogen. Although the yield thus amounts to a mere 1 per cent, their services to mankind are free.

How can the economy best take advantage of this freely offered microbial contribution? Here, as in photosynthesis, applied and fundamental research can have substantial results.

The various strains of leguminous plants and those of fixing bacteria can thus be inventoried and assessed to ascertain the combinations which produce the best yields, and then to "innoculate" each legume crop with the most suitable bacteria.

Another possible approach is to associate non-leguminous cultivated plants (notably cereals) and nitrogen-fixing bacteria. Certain free-living bacteria in the soil (azotobacter, spirillum) or certain symbiotic bacteria found on wild grasses of no agricultural value can thus be used.

The genetics of nitrogen fixation can be explored, and an attempt be made to identify the site in the chromosome of the bacteria which is responsible for the enzyme (nitrogenase) which controls the transformation, and transfer it to bacteria which have no such enzymes. This has already been done experimentally for a very common bacteria (*Escherichia coli*). A more daring approach still would be to fix it directly by genetic manipulation in the chromosome of a major cereal.

A final possibility, though beyond the bounds of agriculture, would be to synthesize nitrogenase chemically, thus enabling the fertilizer in-



Biological nitrogen fixation. The energy needed to produce nitrogen fertilizers can be partially saved by using micro-organisms which can fix their own nitrogen. Above : ferns in a rice paddy harbour such micro-organisms (blue algae) which help fertilize the rice.

dustry to manufacture nitrogen by catalysis, that is, very cheaply (a few kilograms of enzymes would suffice for world production).

The programme adopted by OECD will focus on the genetics of nitrification. Workshops of scientists will periodically be organised to identify those segments of the discipline where specialists are most conspicuously lacking. By awarding research fellowships the project will help to fill specific gaps in present research.

The use of wastes rich in carbohydrates

Agriculture harvests only a fraction of the plants it produces — only a third perhaps on a world scale. In addition there are the wastes from animal husbandry, forest management and the timber industry, and the unused by-products of the agro-food industries, which together amount to a huge mass of potential raw materials. A case in point often mentioned is cereal straw, which in such countries as the United Kingdom or France, in terms of calorific value accounts for some 75 per cent of all energy used in these countries' agriculture. At least one fourth of the straw is now burned or ploughed in, although it could be recovered for more productive purposes.

This in no way means that the use of agricultural wastes will enable the food and energy problems to be quickly solved. Before any substantial industrial facilities can be put in place, the economics of processing such products will have to be carefully analysed, since they might be used in many different ways and will be competing with other existing raw materials. Carbohydrates of the phytomass can, depending on the characteristics of the wastes which give rise to them, mainly water content, undergo physical, chemical or biological changes culminating in widely varying marketable products. They may :

- be made more digestible and processed as cattle feed (straw treated with caustic soda or ammonia for example)
- be converted by combustion, gasification or fermentation into solid, gaseous or liquid fuels

- through specific forms of treatment (pyrolysis, hydrolysis, etc.), provide a number of materials which can serve as a new material for the petrochemical industry.

The choice of one system or another will depend on careful economic analysis, in which the following factors will have to be taken into account :

- the cost of the raw material delivered to the processing plant. A disadvantage of agricultural wastes is that they are widely scattered, particularly crop residues and to a lesser degree recuperable waste materials from food processing plants. The greater the flow of input needed by the processing plant, the higher such transport costs will be (as in manufacturing products of the petrochemical type), while they will be more easily borne if the materials can be processed by small local units (as in the case of feedstuffs).
- the cost of the actual processing. This is another field where the use of micro-organisms performing under soft chemistry conditions (low temperature) and enzymes could in future provide highly effective solutions.

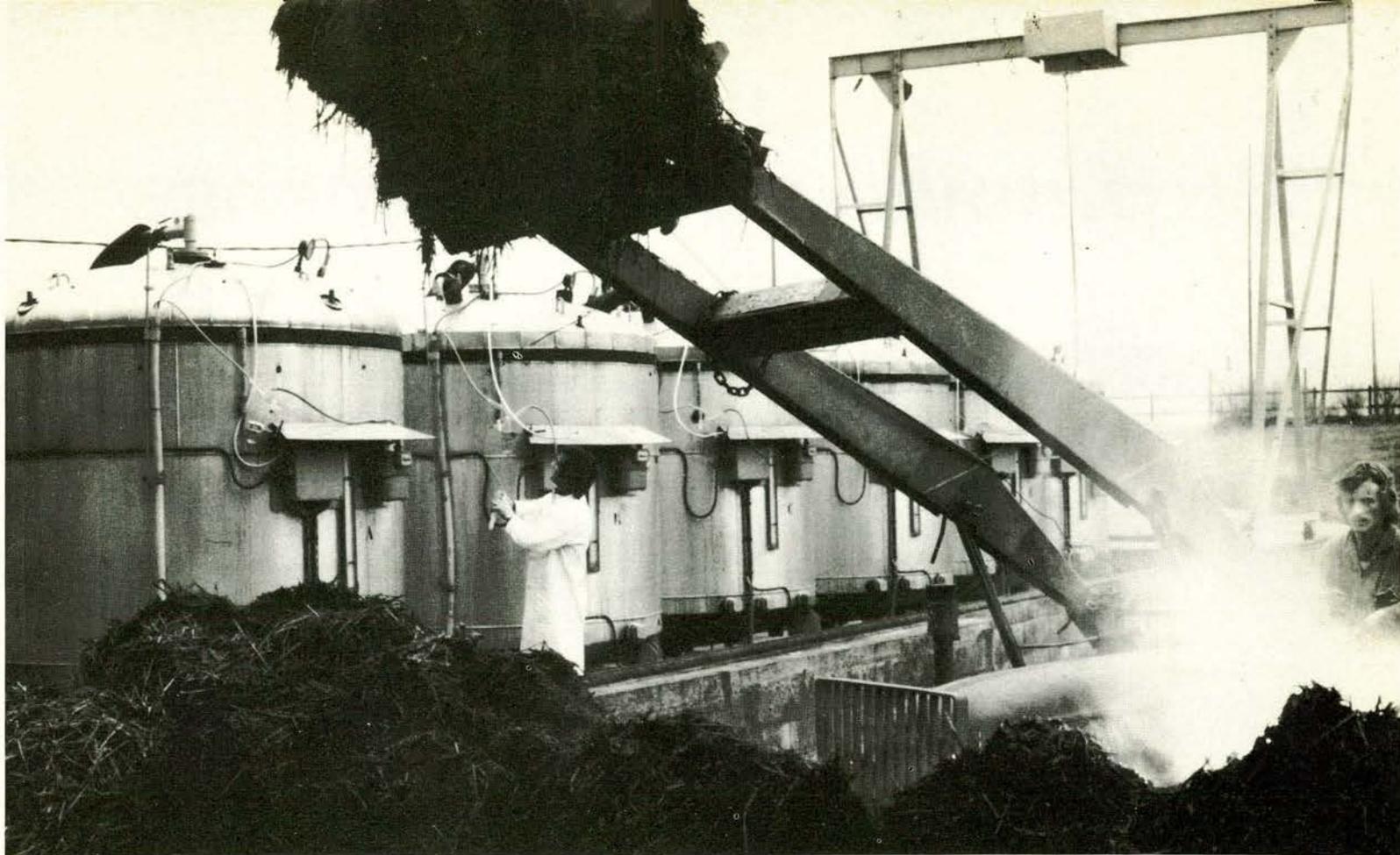
Research projects under the OECD programme anticipate such practical concerns. They will focus on the search for :

- physical, chemical and biological ways of processing complex carbohydrates for use as feed (notably cattle feed) and perhaps for human consumption
- physical, chemical and biological ways of transforming complex carbohydrates into simple, straight-chained structures for use by the chemical industry.

Elimination of mycotoxins

The problem of mycotoxins is far less understood, perhaps because they were discovered only twenty years ago following a disease outbreak in turkeys in the United Kingdom, and also perhaps because the problem mainly occurred in developing countries.

On a world scale, however, mycotoxins cause considerable damage



Use of wastes rich in carbohydrates. Above : plant wastes being made into organic fertilizer and methane at the Institut National de la Recherche Agronomique in France.

by rendering a very high proportion of plant products unfit for use — a figure of 25 per cent is advanced by some specialists — and by afflicting livestock and even man with serious, sometimes fatal diseases: one mycotoxin (aflatoxin B 1) is the most lethal carcinogen so far known.

Mycotoxins are substances produced under specific conditions by some of the 100,000 species of moulds capable of developing on food products. They particularly thrive in developing countries, because there the natural environment often favours the proliferation of moulds and mechanisation has sometimes shortened the harvesting period which means that the crop must be left on the ground longer owing to the lack of storage facilities. Moreover the difficulty of monitoring what products are consumed, owing to the existence in these countries of small markets (which are often black markets as well) and certain eating habits (as the preparation of rice for several days' use) make intoxication of people and animals more likely. The effects of mycotoxins on the populations of developing countries are still inadequately known since they are cumulative and symptoms are late to develop, but it is likely that certain diseases of as yet undetermined origin can be attributed to these substances — infant cirrhosis in India, for example — which may be transmitted by the mother's milk.

Harvesting and storage conditions in the industrialised countries are such that any danger from mycotoxins is fairly small. As the main risk lies in importing contaminated products from Third World countries, the industrialised countries are introducing rules defining the maximum amount of mycotoxins which domestic or imported food products may contain, which in turn create heavy problems for the exporting countries.

In dealing with the mycotoxin threat, work has begun only recently. Fundamental research is needed to gain more knowledge about the ecology of moulds in the hope of redirecting their metabolism so as to produce substances detrimental neither to human activity nor human health.

Shorter-term applied research must develop reliable methods for identifying mycotoxins so that early action can be taken in case of contamination and product quality be tested at the place of shipment.

At the same time effective and economical methods of "decontamination" should be investigated (groundnut and cottonseed cakes are already being treated with gaseous ammonia).

This kind of research is recent (dating back a mere twenty years) and highly relevant as it is of interest to medical as well as agricultural research. Obvious international implications relate to regulation, trade, economic assistance and co-operation; the reason for a research programme sponsored by OECD hence is clear. The main lines adopted are:

- protection of agricultural products before, during and after harvesting
- study of mould ecology (restricted to moulds producing tricothecene, zearaleone and ochratoxins)
- rapid detection methods for mycotoxins
- decontamination (including detoxification) of food products for use by livestock or by man.

A New Agriculture?

The research topics adopted under the OECD project clearly point the way to a "new agriculture". One of its features will be the extraordinary growth of biological engineering (including the mastery of genetic manipulation and domestication of micro-organisms) made possible by recent scientific progress. This is not unlike the "mechanical revolution" which has been in large part responsible for the high level of productivity in agriculture in the industrialised countries. It is interesting to note, however, that, while the mechanisation of agriculture depended on the availability of cheap fossil energies, it is the increase in price of such energy sources which is inducing the changes now taking place.

INTERNATIONAL TOURISM Slowdown and Resurgence

With a growth rate of 19 per cent in 1979 (against 25 per cent in 1978), international tourism receipts for the twenty-four OECD Member countries amounted to US\$ 62.3 billion, while expenditure, rising by 22 per cent (against 25 per cent) totalled \$ 66.3 billion. The expansion in tourism payments for the OECD area thus continued at a slightly reduced but nevertheless substantial pace.

However, these high rates essentially reflect the incidence of inflation, which continued to increase in most Member countries (9 per cent for the whole of the area) together with the book-keeping effect of the relative depreciation of the dollar, used as unit of account. In real terms, growth was of the order of only 3 per cent, against 7 per cent in 1978 and 13 per cent in 1977. Thus the gradual recovery from the decline in 1974 due to the oil crisis has been followed, since 1978, by a fairly marked downturn in growth.

International tourism in the OECD area in 1979 suffered the effects of the worsening economic situation, reflected in the lower rates of increase of real GNP, real disposable income of households and volume of private consumption, while consumer prices rose and unemployment was high.

For the OECD area in 1979, the increase in international tourism receipts in real terms roughly matched the increase of arrivals of foreign tourists in twenty Member countries and Yugoslavia (3 per cent, compared with 6 per cent for the previous year.) As to tourist flows from the four main generating Member countries, only those from the United Kingdom increased in 1979. Flows from Germany seem to have remained at the previous year's level, while flows from France fell back even more than those from the United States. One particular point to note is the very heavy growth in the number of tourists from Japan.

This overall trend essentially reflects that of international tourism receipts, in real terms, of the European Member countries combined, which account for most of the OECD area's receipts (76 per cent in 1979); this growth was faster than in 1977 (18 per cent) but then slowed

down more rapidly and markedly (7 per cent in 1978 and 2 per cent in 1979).

The growth of international tourism receipts (in real terms) in North America also slowed down but was higher than for the OECD area as a whole (4 per cent in 1979 against 9 per cent in 1978, having remained level in 1977). For Australasia and Japan, the growth rate for real international tourism receipts was high (13 per cent in 1979).

A New Context

Among the various problems which will continue to confront the tourism sector, those related to energy will become increasingly important in the years to come and will call for special attention on the part of governments and the travel trade. The succession of oil price rises since 1979 (135 per cent between the end of 1978 and the second quarter of 1980) have contributed to higher inflation and an economic downturn in OECD Member countries. On top of this, uncertainties about future oil supplies and the risk of further unforeseeable price increases would not seem to constitute a very favourable economic climate for any appreciable expansion in international tourism in the OECD area during 1980.

Heavy inflationary pressure, rising unemployment, an imperceptible rise in real disposable income of households, a levelling-out in private consumption and serious balance-of-payments problems at present characterise the general situation in the OECD area. Measures taken by Member countries to arrest this unfavourable trend and restore confidence involve strengthening their energy policies and the cooperation of the private sector and the consumers, with the aim of reducing dependence on oil and thus limiting the unfavourable effects of short-term disturbances in the oil market.

A smooth medium-term transition towards an economy which would be less dependent on oil is a prerequisite for the growth of national economies. All sectors of the economy, including tourism, will clearly be called on to help implement the measures governments are advocating. It is therefore doubtful whether any particular sectors can be excused from playing their part, since all are essential to

the general equilibrium of the economies of which they form part. However, this does not rule out the possibility of assistance to some sectors in coping with a difficult transition.

All sectors will suffer, directly or indirectly, from the economic repercussions of the changes that will take place in the years to come in the processes of energy production and methods of energy consumption. It would seem that tourism in the OECD area, affected at present by the distinct slowdown in economic growth in many Member countries, may be able to achieve a new balance provided that all concerned in the industry objectively assess the events to which tourism must adapt and make the necessary adjustments.

An Effort of Adaptation...

It is essential that the tourism sector, at its own level and within its own frame of reference, consider the consequences of government measures related to energy which might be adopted. It will have to demonstrate its capacity to adjust to the new conditions under which tourists will use the various modes of transport and under which tourist accommodation will have to be set up and operated. No time should therefore be lost in anticipating the ways in which tourists and the tourist industry will react, so that adaptation to the newly emerging situations can be eased.

As regards transport, increasing the price of petrol by enough to induce motorists to consume less overall, for example, will lead them to make choices, unless they are willing to pay more for every journey, which a majority will not be able to afford. One solution will be to drive shorter distances, another will be to choose cars which use less fuel, yet another will be to choose a less expensive means of transport. These three solutions may, of course, be combined. The first option is the most immediate and, so far as it would affect tourism, could lead to fewer holiday trips by car per year, visiting fewer countries or regions on any one trip and, in particular, a reduction in the number of arrivals in receiving regions by motorists coming from distant places. These facts have been observed in 1979 in the international tourism outturns for Member countries.

TRENDS IN INTERNATIONAL TOURIST RECEIPTS IN REAL PRICES

per cent change from previous year in US \$: in 1972 prices & exchange rates

From 1972 to 1979 the expansion in real terms of international tourist receipts of the OECD zone was accounted for mainly by the United States, France, Italy and the United Kingdom.

COUNTRY	72/71	73/72	74/73	75/74	76/75	77/76	78/77	79/78	Index	% of total 1972	% of total 1979
									1979 1972 = 100		
Austria	+ 15.0	+ 2.7	- 0.2	+ 3.9	- 0.5	+ 4.1	+ 6.8	+ 4.8	123.5	8.4	7.5
Belgium/Luxembourg	- 0.1	+ 20.3	- 1.6	+ 1.5	- 4.8	+ 18.1	- 6.5	+ 12.0	141.5	2.2	2.2
Denmark	+ 10.5	- 5.6	- 2.6	- 1.2	+ 4.2	+ 4.4	-	+ 1.4	100.2	2.4	1.7
Finland	+ 26.5	+ 2.7	- 15.8	- 12.1	- 0.1	+ 3.9	+ 10.7	+ 6.3	92.9	1.2	0.8
France	+ 9.0	+ 12.9	+ 3.1	+ 4.2	+ 6.7	+ 13.2	+ 13.5	- 1.5	163.8	8.7	10.4
Germany	+ 6.4	- 8.3	- 4.3	+ 9.9	+ 13.0	+ 6.0	+ 4.1	+ 3.8	124.9	9.2	8.4
Greece	+ 23.2	+ 12.5	- 32.5	+ 34.8	+ 31.8	+ 6.3	+ 20.0	+ 6.2	182.9	1.9	2.6
Iceland	+ 18.8	+ 28.0	- 0.9	- 25.2	- 6.3	+ 4.0	+ 16.7	+ 6.6	118.3	0.0	0.0
Ireland	- 18.1	- 10.0	+ 3.3	+ 14.4	-	+ 20.1*	+ 12.5	- 21.0	(103.4)	0.9	0.7
Italy	+ 1.9	- 1.5	- 24.4	+ 15.4	+ 7.1	+ 68.5	+ 13.2	+ 11.1	195.3	10.8	15.3
Netherlands	+ 7.7	+ 3.8	- 7.0	- 7.3	- 7.9	- 8.8	- 4.5	- 6.6	67.1	3.6	1.8
Norway	+ 3.7	- 3.0	- 4.4	+ 15.3	+ 6.4	+ 6.5	+ 7.4	- 3.5	125.4	1.0	0.9
Portugal	+ 19.4	+ 11.1	- 30.6	- 51.9	+ 28.9	+ 23.4	+ 49.0	+ 38.7	121.9	1.9	1.7
Spain	+ 8.1	- 7.6	- 9.3	- 8.1	- 9.9	+ 21.4	+ 11.1	- 9.9	84.4	12.9	7.9
Sweden	- 2.9	+ 9.1	+ 10.2	+ 4.2	- 1.8	+ 16.5	+ 11.3	+ 4.2	166.1	0.9	1.1
Switzerland	+ 5.7	- 1.0	- 12.0	- 7.4	- 0.5	+ 9.9	- 7.4	- 5.2	77.4	5.3	3.0
Turkey	+ 36.3	+ 41.9	- 5.8	- 6.5	- 11.6	- 8.6	+ 4.8	+ 32.7	140.5	0.5	0.5
United Kingdom*	+ 7.8	+ 16.4	+ 6.6	+ 9.3	+ 25.3	+ 14.1	- 1.6	- 2.7	185.6	7.1	9.6
EUROPE	+ 7.8	+ 2.1	- 7.1	+ 2.7	+ 5.6	+ 17.7	+ 7.3	+ 2.0	132.6	78.9	76.1
Canada	- 14.3	+ 8.3	+ 1.5	- 4.0	- 3.5	- 1.6	+ 4.8	+ 9.7	115.1	5.6	4.7
United States	+ 7.1	+ 14.0	+ 10.9	+ 10.0	+ 12.2	+ 0.6	+ 8.6	+ 4.2	117.4	13.4	17.3
NORTH AMERICA	- 0.2	+ 12.3	+ 8.2	+ 6.2	+ 8.4	+ 0.1	+ 7.8	+ 5.3	159.1	19.0	22.0
Australia	- 11.0	+ 0.4	+ 15.6	- 3.2	+ 1.5	+ 15.7	+ 11.1	+ 11.6	163.7	0.8	0.9
New Zealand	(+ 23.5)	(+ 21.0)	+ 17.3	+ 20.5	+ 3.0	- 9.6	- 11.0	+ 1.3	143.4	(0.3)	0.3
Japan	(- 4.7)	(- 17.9)	(- 1.9)	(- 2.3)	+ 12.7	+ 13.5	- 16.7	+ 21.0	103.3	(1.0)	0.7
AUSTRALASIA-JAPAN	- 4.0	- 5.3	+ 8.6	+ 1.9	+ 5.9	+ 8.9	- 4.3	+ 13.0	130.8	2.1	2.0
OECD	+ 5.9	+ 3.9	- 3.7	+ 3.5	+ 6.3	+ 13.3	+ 7.1	+ 2.9	137.6	100.0	100.0

() estimation

- without any change

* new series.

The second solution, which might give the motorist more freedom to travel, implies a restructuring of motor manufacturing (especially in North America) and an attempt to apply new technologies. These seem sufficiently advanced to be introduced gradually over the years ahead. Meanwhile the third solution, requiring tourists to choose carefully between private car and collective transport according to the type of trip and the distance to be covered, may induce carriers to rethink the kind of service they offer. Railways, less dependent on oil when their lines have been electrified, airlines and coach companies, dependent on oil but able to profit from economies of scale despite higher fuel costs, thanks to their larger customer base, might be stimulated to offer new transport packages for tourists to offset the advantages of the private car (individual comfort, speed of travel and, mainly, flexibility and autonomy

of movement). One possibility here (apart from carrying cars together with their drivers on trains) would be to supplement a number of frequent, fast, economic and comfortable point-to-point services (innovations introduced by the international railways in Europe during 1979 and 1980) with efficient, varied means of transport in the destinations chosen by tourists.

A general increase in energy prices through all economic sectors will have the effect of further reducing consumer purchasing power. Consumers will then be more sensitive to the cost advantage of collective transport over the car, even when basic fares are higher than at present, because all transport modes without exception will have been affected by the international rise in energy prices. The fact that tourists will travel more often by rail, air or coach is likely to mean more business for travel agents until computerized reservation systems are fully

operational. The need to facilitate travel for tourists once they have reached their destinations may lead tour organisers to intervene more often in this context.

As regards means of accommodation, higher prices for electricity, gas and domestic fuel will raise the costs of tourist services insofar as there is no reduction in consumption, since hotels and other firms providing accommodation usually have rather small profit margins. It is therefore essential that these enterprises undertake the necessary insulation and refitting and replace certain equipment in order to reduce further their energy consumption. Unless they can benefit from government measures designed to lighten the financial burden, they will have to pass on the whole of their outlay in the rates they charge, or be prepared to accept a temporary reduction in profit in order to remain competitive. Future accommodations will have the advantage:

they will have to comply with technical energy-saving standards.

... and a New Period of Growth

International tourism seems to have emerged from an era of relative facility and spontaneous expansion. A transitional period of adjustment and innovation is opening up. This should enable the tourism industry in OECD Member

countries to prepare for a new period of growth. It is against this background that tourism must plan its investment and marketing if it is to maintain its position in the economies of Member countries. In contrast to the situation of twenty years ago, a large proportion of their nationals have considerable experience of international travel. This clientele is better informed, can express its preferences more clearly, has become more demanding and

also more careful about how much it spends. The unfavourable economic situation does not suppress people's need to travel: tourism, especially tourism abroad, has been an integral part of the way of life in OECD Member countries for many years. The habits acquired by large portions of the population provide a sufficiently strong basis to enable the tourism sector to adapt, in a difficult period, to new relationships between prices and services.

LETTER TO THE EDITOR

I read with great interest your March, 1980 issue, and in particular, the article by Prof. Guy Berger entitled "The Consequences for Higher Education." Prof. Berger notes that "interdisciplinarity is both the foundation and the stumbling block of education based on close relationships with the community." As his text suggests, a more accurate statement would read, "Interdisciplinarity ought to be the foundation of all education, and proves to be the stumbling block not only for relations with communities, but also for those within the university itself."

The isolated categories into which we pigeon-hole not only knowledge, but also technologies, ideas, relationships, and a deplorably expanding list of human and social phenomena, serve as one of the greater hindrances to education of all kinds. Unfortunately for scholars and administrators, society is already moving to eliminate several categories we have used. (An example? Computerized typesetting, and the spread of cable television systems are all but eliminating the distinction between print and broadcast journalism. Other examples may be drawn from nearly every arena of human endeavor.) Those categories are becoming obsolete.

This of course means that a social scientist who is unaware of ongoing technological growth and development has relegated himself to that seemingly serene discipline called "intellectual history". The research chemist who is unaware of social pressures for safer use of his products may well find his work, one day, the subject for a case study in a course not on chemistry but on social criminality. In short, the disciplines as we knew them are obsolete, or at the very least, on their way to obsolescence.

Unfortunately, universities have failed to respond to these changes in the educational environment. After a brief flirtation with in-

terdisciplinary studies in the late Sixties and early Seventies, universities in the US are again returning to the disciplinary format. Even subfields (i.e., International Relations or American Government within a Political Science department) are becoming more — not less — isolated from one another. Increasingly, scholars cannot even converse with one another, let alone agree on goals or objectives for the university and its community. Specialisation has robbed us not only of knowledge and perspective, but also of courage and initiative.

For what professor would willingly give up his right to teach a particular subject in order to allow someone else in his own department (let alone in a different department) the chance to do so? In an era of decreased enrollments, an era in which tenure is in no small way a measure of course attendance and popularity, who would dare make such a sacrifice?

It is up to all members of the university community to demand the kind of awakening suggested by Prof. Berger. Most especially, it is up to the students — both on campus, and within the community — to play a leading role in voicing these demands. For administrators and professors are bound by the ropes of their own professional and personal insecurities; they can no more fight for change than they can avoid the very parochialism which must end if such change is to come about.

Long ago, physicians were advised to heal themselves. Later, in our time, it might be advisable for educators to educate themselves. For they are rapidly losing their ability and their validity in their attempts to educate others.

Ben Zingman
Ph. D Candidate
Rutgers University, US.

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