

AUGUST 1967

Marxism Today

EDITORIAL COMMENTS

In Honour of Maurice Dobb

**MAURICE DOBB: A TRIBUTE FROM
CAMBRIDGE**

- J. R. CAMPBELL **MAURICE DOBB—COMMUNIST,
ECONOMIST, HISTORIAN**
- E. J. HOBSBAWM **CAPITALIST DEVELOPMENT: SOME
HISTORICAL PROBLEMS**
- RON BELLAMY **THE SCIENTIFIC REVOLUTION AND
THE PRODUCTIVE FORCES OF MODERN
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Editorial Comments

In Honour of Maurice Dobb

We devote the greater part of this August issue of *Marxism Today* to articles written in honour of Maurice Dobb, who, this summer, retires from his post as Reader in the University of Cambridge.

We print, with pleasure, a tribute from his Cambridge colleagues, and articles about his work or related to the subjects of his studies, by J. R. Campbell, Eric Hobsbawm, Ron Bellamy and John Eaton, who have all, in one or another capacity, known him, worked with him and respected him.

Others will be paying tribute to Dobb's work in more academic and formal form. But Dobb is a Communist as well as an economist. He is not only a learned historian of capitalism but has spent most of his life fighting against it, and has always been as interested in its end as he was in its origins. He was a sociologist long before sociology became a fashion, but was also from his student days, a socialist and a pioneer in the serious study of socialist society.

We found not long ago a little book published at Cambridge by Heffer in 1920, under the title of *Demosthenes Demobilised*. It is a record of Cambridge Union Debates in the 1919-20 period with appreciations of the various speakers. "The best of the younger speakers" is the verdict in 1920 on Dobb's contributions, or again, "one of the clearest thinkers in the House".

That clarity of thought and expression has always marked his work from learned polemic amongst professional economists (where such clarity was rare) to the popularisation of socialist ideas in which he excelled.

Amongst Dobb's various virtues, which it is not our purpose here to outline, is a profound and disarming modesty. There can rarely have been one knowing so much who proffered his opinions with such humility, who was so patient with those who could or would not understand, nor so helpful and encouraging to those who were just beginning.

His work was internationally recognised. If he had not been so firm in his principles he would certainly be retiring from much more senior positions.

From the first formation of *Marxism Today*, Maurice Dobb has been a regular contributor and an active member of the Editorial Board. We wish him every success for the future. "Retirement" is

only a word. We know that, in his case, it can only mean still more time for the cause which he has always, so well, and in so many ways, supported.

Bomber Base in Thailand

The American Government, in the course of its aggression against Vietnam, is in the process of transforming Thailand into a vast military base, or, in the words of *Business Week* (May 13th), into a "major new bastion of US military power".

It appears that already there are some 36,000 American military personnel in position, threatening not only Vietnam but Asia in general and China in particular, or, again in the words of *Business Week*, there is a build-up that "will enable the US to maintain a military presence in South-East Asia outside South Vietnam". A large part of the bombs that now fall on Vietnam come from US planes based in Thailand.

The American Labor Research Association estimates (in their *Economic Notes* of June 1967) that there are nearly 500 million dollars of US taxpayer's money involved in contracts for building up the Thai bastion.

It gives fact and figure of those who are profiting, some at a "cost-plus-award-fee contract that has grown so far to 90 million dollars" with the consortium involved earning bonuses for "good performance and cost control". Another consortium is working on an Army depot and an air base, another on a military highway system with a contract already running to 50 million dollars and another 20 million likely "before the job is finished".

How many times must one recall Lenin's dictum that "war is very terrible, but it is terribly profitable".

Lessons from the Setback in Indonesia

At the end of 1965, following what was known as the September 30th Movement, political power was seized in Indonesia by a group of right-wing generals.

Hundreds of thousands of Communists and other patriots and democrats were massacred in one of the most ruthless waves of counter-revolutionary terror that the world has ever known. President Sukarno was removed from authority; the anti-imperialist direction of Indonesia's policy funda-

mentally reversed, and the democratic rights of the people virtually crushed.

How could this happen? How was it possible for a mass Communist Party with some three million members and ten million votes to suffer so sudden and complete a disaster?

It will not be easy to rebuild the movement in Indonesia. But the Indonesian Communists still fight on. With patience and at great sacrifices, they are regrouping their forces and working to re-organise the Party.

They have been discussing their experiences, in order to try to assess the reasons for their terrible setback. Some of these assessments have been printed and are being distributed in Indonesia despite the terror.

One such document has been received in London. It is entitled "For a Sound Indonesian Revolution", and was issued by a group which calls itself "The Marxist-Leninist group of the Indonesian Communist Party". It attempts to make a general analysis of the recent Indonesian events.

The document is too long for *Marxism Today* to publish it in full, but we are proposing in our next (September) issue to give a full summary of the document, with substantial quotations from it.

Since the right-wing coup, save details of the terror, there has been but little information from Indonesia. We thought our readers would be glad of this analysis that comes from the heart of the continuing struggle, which shows that the Party has not been destroyed, but that, in the most difficult conditions, it is discussing and analysing the setbacks, in order to learn from mistakes, and to arise stronger than ever in the future.

From Anathema to Dialogue

Perhaps no one on the Marxist side has done more to break barriers and further dialogue between Marxists and Catholics than Roger Garaudy, Professor at the University at Poitiers and member of the Political Committee of the Communist Party of France.

It is very good, therefore, that Collins, who have already served the dialogue by publishing English translations of many of the main works of Teilhard de Chardin, should publish Garaudy's now famous contribution *From Anathema to Dialogue*,¹ with an introduction by Karl Rahner of the Society of Jesus, and an epilogue by the Catholic Professor J. B. Metz.

Part of the discussion is on a rather lofty philosophico-theological level, difficult reading for those

¹ Roger Garaudy—*From Anathema to Dialogue*, Collins, 25s.

to whom it is new. But the greater part of Garaudy's argument is the opposite of remote or abstract.

The dialogue, he argues, at the outset, "is an objective necessity of the age". In the second half of the twentieth century "it has become technically possible to annihilate all civilised life on earth. . . . This is an incontestable fact". And he continues:

"The second incontestable fact is that two great conceptions of the world motivate men on this earthly globe. . . . Hundreds of millions of men find in religious beliefs the meaning of life and death, and the very meaning of the history of our race, while other hundreds of millions find that Communism gives a face to the hopes of the earth and a meaning to their history. Thus it is an incontestable fact of our age, that the future of man cannot be constructed either against religious believers or without them. Neither can it be constructed against the communists or without them."

Having argued the necessity of dialogue, he proceeds to discuss at length, what he considers fundamental to Catholic beliefs and Marxist approaches, pointing out differences and looking for common ground.

And he ends, where he began, with renewed appeal for dialogue:

"We offer a dialogue without prejudice or hindrance. We do not ask anyone to stop being what he is. What we ask is, on the contrary, that he be it more and that he be it better. We hope that those who engage in dialogue with us will demand the same of us."

Dialogue in Britain

In Britain the Christian-Marxist dialogue is proceeding in many diverse forms and different places.

On June 2nd-4th at Midhurst in Sussex an extremely interesting 10-a-side discussion took place between Quakers and Communists on the subject of "Man, Society and Moral Responsibility", sponsored jointly by *Marxism Today* and the East Europe group of the Quaker Peace and International Relations Committee.

Perhaps the deepest debate developed in the session dealing with the morality of capitalism, or, as it was formulated, "the limitations on goodwill imposed by the economic necessities arising from the capitalist structure of society". Another important and polemical discussion centred around the nature of human nature, how far it was subject to change, and how far perfectible.

Much useful discussion took place on practical social problems and on continued co-operation. And, certainly, amongst the most positive features of the meeting were the mutual friendships made.

Liverpool witnessed an event which a few years ago would have been unthinkable when, at the end

of June, over 300 people, including nuns and trade unionists, attended a public Catholic-Communist discussion on Pope Paul's latest Encyclical on "The Development of the Peoples" (*Populorum Progressio*). It was held in the Chaplaincy of the new Liverpool Cathedral with Father McGoldrick in the Chair, and amongst the speakers, the Catholic journalist Frank Hendry and Gerry Cohen, the Merseyside Communist Party Secretary.

Arrangements are now in progress for a 15-a-side dialogue to be held on October 6th-8th at St. Katharines, Stepney, sponsored jointly by the East-West Committee of the British Council of Churches and by *Marxism Today*, with the Rev. Alan Ecclestone in the chair.

The general subject for discussion will be Human Dignity, with more general theoretical problems of Man and Society on the first day, and more practical issues of peace, and poverty and mutual co-operation on the second.

The dialogue has certainly developed very widely since our own Christian-Marxist Dialogue was opened by Dr. John Lewis in March 1966. We are proposing now to wind up the *Marxism Today* discussion with the Editor's contribution and Dr. Lewis's general reply to the discussion in September. The whole series of articles will then be published in book form by Lawrence & Wishart.

Still More Light on Tressell

In June we printed an article by F. C. Ball—*More Light On Tressell, The Story of a Search*—in which the disclosure that Tressell's real name was believed to be Croker and not Noonan and the evidence for this was discussed.

At the very time of the article appearing an amazing development in the Tressell story was taking place. On May 29th BBC2 presented a dramatised version of Tressell's book *The Ragged Trousered Philanthropists* and this produced an astonishing sequel. It has always been accepted by friends that Robert Tressell at his death in 1911 left an 18-year-old daughter Kathleen who emigrated to Canada on the £25 she received for her father's manuscript and there married and was killed with her child in a car crash.

This story had never been disputed, despite the fact that there was no documentary evidence to back it up, and, in the fifty years since, nothing further had been heard either by friends or by the publishers, despite the fact that this story had appeared in F. C. Ball's book *Tressell of Mugsborough* and in numerous newspapers and journals, until the dramatic sequel to the play. On June 5th, *The Times* published a news item stating that Miss Kathleen Noonan had been unable to watch the television adaptation of her father's play because

she was not able to afford a TV set. It was true, Tressell's daughter was in fact alive and living in England.

Tressell on TV

It was inevitable that one day we would see a dramatic adaptation of *The Ragged Trousered Philanthropists* on film or television.

The success that it had as a play at Unity Theatre in the late 'forties was tremendous. Now, twenty years later, Christopher Morahan directed Stuart Douglass's adaptation of the novel for a fine production on BBC2.

The dramatic quality of the play and its intensely topical political lessons blended together. "This was no museum piece", wrote the *Morning Star* critic, "for the basic argument against capitalism has lost none of its force since it was written". "A viewer completely ignorant of the book", wrote *The Guardian*, "must have known that he was seeing something based on a masterpiece."

It was much too good a production to be limited to the viewers of BBC2 and every effort should be made to persuade the BBC to repeat the programme on BBC1.

Marxism and History

As the interest in Marxism widens, more and more people want to know what works with a Marxist interpretation have been published in the past. The recently published Bibliography of English Language Works, *Marxism and History*, by Lionel M. Munby and Ernst Wangermann (Lawrence & Wishart, 15s.) is therefore an extremely welcome and valuable addition to the library of Marxists and people interested in Marxism.

Munby and Wangermann used as the basis for this bibliography the duplicated version issued some years ago by the History Group of the Communist Party of Great Britain. But they greatly expanded it and included publications of authors who, as they say in their foreword:

"have tried to apply, or seem to us to have applied, to a greater or lesser extent, the historical method of Marxism. We have rejected the alternative which would have been to include only those works about the 'Marxism' of which there was an overwhelming consensus of opinion. It seemed more useful to maximise access to Marxist ideas than to attempt to define a canon."

The bibliography lists and classifies 1,234 original works in the English language published up to the autumn of 1966, and is divided into four main sections. The first covers theoretical works and works on the history of ideas, the arts and sciences; the second works on general history, including British history, up to about the sixteenth century; the

third section modern foreign history under three general headings and then under specific countries; and the final section covers modern British history. An index of authors at the end facilitates easy reference.

While making no claim to completeness (in particular, work on the Americas and on post-revolutionary Russia and the USSR is not yet fully covered), this bibliography, the first of its kind to be printed, includes not only books but pamphlets and contributions to journals.

Manchester Martyrs' Centenary

It was on November 23rd, 1867, that three Irish Fenians—Allen, Larkin and O'Brien—were publicly hanged at Salford Jail, Manchester. Judicially murdered, they have been known ever since as the Manchester Martyrs.³ They had been indicted for murder and were alleged to have assisted at the daring escape of two Irish Fenian leaders—Colonel Kelly and Captain Deasy—from the prison van taking them to Salford Jail.

On Saturday, November 23rd, the execution day, Manchester was virtually an armed camp. Mills and warehouses were defended by army and police, barricades erected and manned by the 72nd Highlanders complete with field guns.

The trial and execution were amongst the most blatant examples of witch-hunting justice in Britain's history—and this is to say not a little. Throughout Ireland there were vast meetings of protest. Some 80,000 attended a funeral procession in Dublin. In England thousands demonstrated at Clerkenwell and Hyde Park. Many a song has been sung to their memory which has inspired succeeding generations of the Irish national movement.

One of the songs ends:

"So now, kind friends, I will conclude, I think it would be right,
That all true-hearted Irishmen together should unite;
Together should unite, my friends, and do the best we can
To keep the memory ever green of the boys that smashed the van."

To keep their memory ever green, the Manchester Branch of the Connolly Association intends next November, on the centenary of their execution, to erect a bronze plaque at the site on which it took place. The jail, now demolished, stood in New Bailey Street which is the continuation of Bridge Street,

³ *The Story of the Manchester Martyrs*, by James McGill and Tom Redmond, a pamphlet published by the Manchester Branch of the Connolly Association, in 1963, tells the story of their martyrdom.

connecting Manchester with Salford. The present owners of the site—*The Guardian and Evening News*—have approved the scheme, and Arthur Dooley, the Liverpool sculptor, has been commissioned to design the plaque. A public appeal for funds has been opened,³ and, if sufficient support is forthcoming, it is hoped to bring over a boulder of Wicklow granite to serve as base for the plaque.

Tribute to William Gallacher

A research group at the Humboldt University of Berlin in the German Democratic Republic has prepared, in honour of the late William Gallacher, a collection of memories of Gallacher's life by veteran trade unionists, personal friends, and comrades from the political struggle, along with essays on topical problems of working-class literature.

Amongst those who have contributed their reminiscences of Gallacher are Abe Moffat ("Willie Gallacher, Communist MP for West Fife from 1935 to 1950"), Wal Hannington ("We were in Prison together"), D. N. Pritt ("Recollections of Gallacher in Parliament") and Hugh McDiarmid ("A Sprig of White Heather in the Future's Lap").

Amongst the diverse articles are studies on the Scottish Radical poet Alexander Rodger (by Dave Lesslie), on the "Poetry in Ernest Jones' *Notes to the People*" (Georg Seehase), on "Musicians and the Working Class in Britain" (Alan Bush), on "McDiarmid and the Scottish Tradition" (Honor Arundel) and on "Hamish Henderson and the Folk Song Revival" (Jack Mitchell).

Many of Gallacher's GDR friends are amongst the contributors.

As a supplement there is a selection from the work of Thomas Spence, the militant radical and agrarian socialist of the end of the 18th century, whose works are today among the rarest showpieces (and at show prices) of the antiquarian book trade. It is good to see that they will include the "supplement to the History of Robinson Crusoe", the "End of Oppression" and some of the songs which Spence used to distribute from his seditious centre (the Hive of Liberty) in Little Turnstile.

The book is now completed, and, though it has not yet arrived in this country, it should be available by the time these notes appear.⁴ We should be very grateful to those who prepared it.

³ Manchester Martyrs Plaque Appeal, c/o Connolly Association, 94-96 Grosvenor Street, All Saints, Manchester 1.

⁴ *Essays in Honour of William Gallacher*, Humboldt-Universität zu Berlin, 364 pages, distributed in Britain by Central Books, 15s.

Maurice Dobb:

A Tribute from Cambridge

ALL over the world scholars and socialists know and admire Maurice Dobb, the Marxist economist and thinker. His studies in political economy—of the growth of capitalism, of the Soviet economic system, of planning, of the problems of growth in underdeveloped economies—have been translated into many languages. He has been invited to lecture in countries as far apart as India and Spain—Italy and Czechoslovakia; he has been honoured by foreign universities. This summer he retires from his post as Reader in the University of Cambridge. Economists in his own university, colleagues in the economic faculty, have produced a volume of essays in his honour, to which writers from eleven different countries, of varying political views, have contributed.

But Maurice Dobb, the learned scholar, the original thinker, the populariser and educator is also a Communist; even his most unpolitical colleagues have always realised this; many and weird have been the theories they have produced to explain to themselves this phenomenon. Those who have known Maurice Dobb as a citizen of Cambridge, as a university teacher, as a comrade in the Communist Party, and as a fellow worker in innumerable peace activities may be able to understand better.

Cambridge

Almost all his life has been spent in Cambridge. He came to the university as an exhibitioner at Pembroke College just at the end of the first world war and took a first class honours degree in both parts of the Economics Tripos. He was a research student for two years at the London School of Economics and then came back to Cambridge to teach. Here he has stayed ever since, except for a short period in 1951 when he was visiting Professor at the School of Economics in Delhi. From the earliest days he was actively associated with the socialist movement, facing rowdy fellow students at political meetings, and canvassing for Labour candidates at elections. For very much of this time it has been a lonely existence. Before the explosion of Communist and Socialist ideas among intellectuals in the 1930s there were few Socialists, still fewer Marxists among the senior members of the university: M. H. Dobb and J. D. Bernal were isolated beacons. But in the town of Cambridge there was a small group of Communists and those who survive still remember

the young don who joined them, patient, considerate, wise and above all modest. These qualities remain to this day. Dobb cannot abide foolishness but his restraint in the presence of fools and bores contains a lesson in Socialist behaviour. It is startling to see him at meetings in his own college rooms insist on sitting on a hard chair at the back, or on the floor, and pressing others to take the comfortable seats.

The 'Thirties

In 1931 David Guest returned to Cambridge from Göttingen a convinced Communist, and set about building a University Communist Party. Dobb, already an expert on the Soviet economy and author of what became the standard university textbook on wages, helped from the beginning. He was one of the few dons who marched out to Girton, in 1932, together with students, to meet the north-eastern contingent of hunger marchers and helped to carry their packs into Cambridge. By the mid-'thirties a handful of University Communists had become a larger and well organised body with a remarkably wide influence throughout the university. David Guest was followed by John Cornford and James Klugmann. Maurice Dobb gave lectures to the united socialist club, served on anti-fascist and anti-war committees, licked stamps, sealed envelopes and knocked on doors. He took part in demonstrations, in London and in Cambridge, lectured and taught wherever he was invited by the working-class movement and wrote for the Party press. Students who heard his lectures may have been prepared for the publication of *Political Economy and Capitalism* in 1937, but to most it was a surprise.

For here was almost the first, original, creative contribution to Marxist economics published outside the Soviet Union, and one that has stood the test of time better than many Soviet works. It even commanded the respect of orthodox economists at a time when university-taught economics and Marxism lived in two different universes.

The War and After

The war years brought new strains, political, academic and personal. Dobb became an A.R.P. warden, and was later associated with the Home Guard. Cambridge lost many of its older students but was flooded with students from London, and Dobb took on a double teaching load. From

the advances made by the student movement in the 'thirties there grew a graduate Communist Party organisation. Maurice Dobb was no longer quite so alone, but his responsibilities were no less. While the Soviet Union was an ally—a series of discussions were held between Marxist and anti-Marxist dons in Trinity College. Cambridge's stalwart opponents of Marxism were joined by Hayek, Ginsberg and others. The burden of the Communist case fell upon Maurice Dobb. His contribution carried weight because it was quite typically, painstakingly prepared, utterly honest, and at times almost apologetic in the modesty of its presentation. For years Maurice Dobb had been a University Lecturer but no College had made him a Fellow. Even in the relatively halcyon days when the glow of being a wartime ally hung round the Soviet Union and Communists bathed in the reflected glory, it was only with difficulty that his friends achieved Maurice Dobb's election as a Fellow of Trinity College.

Wartime strains, extra teaching, politics, did not interrupt the main concentration of Dobb's life. In 1946 *Studies in the Development of Capitalism*, in 1948 *Soviet Economic Development Since 1917* were published; the latter was a revised and much enlarged edition of an earlier work. Both were major contributions in quite different fields; it is not our purpose to discuss them at length here, but they revealed that Maurice Dobb was not only a theoretical economist of the first order, but also a major economic historian with an astonishingly wide scope. In 1951 he took up his cudgel in the journal *History*, contributing to a series of articles on theories of history, an outstanding defence of historical materialism.

Advice and Encouragement

Cambridge now had a senior members branch of the Communist Party, at times quite large and flourishing. Many figures of international importance came to Cambridge for brief or longer stays and visited Dobb. If he had kept a visitors' book in the post-war years, it would contain an astonishing array of names from the past of the revolutionary movements of many countries and of names which were to become famous. They came for advice and to persuade, sometimes to attack. They met with courtesy and attention, received help but never deflected Maurice Dobb from the path he had chosen. And he was never too busy or too proud to speak, when asked, to meetings of students or

workers, large or small, to take part in schools as tutor and student, to canvass in elections. In the most difficult days of the cold war he helped hold together the most diffuse body of people in local peace movements.

Younger graduates in his party branch received constant quiet encouragement. In 1956 and 1957 many of them left the Communist Party. Whomever they blamed, however indignant they were, they never lost their respect and in many cases their affection for Maurice Dobb. Yet it was Dobb who was one of the first to write to the *Daily Worker*, after the Twentieth Congress of the CPSU appealing to his fellow intellectuals to stay in the Party. Not that he did not voice his criticism in his branch, in the party press and at Congress, but he held to the logic of Marxism, aiming to improve not to destroy the revolutionary party to which he belonged.

Communist Example

As the support for the Communist Party among senior members of the University dwindled in the late 'fifties and early 'sixties, Dobb must often have felt a little disconsolate, but he rarely showed it. In no small measure his presence and behaviour held together a weakened and sometimes rather gloomy party branch. There was a time when he ironically remarked that it was quite disconcerting walking in the streets of central Cambridge, because so many ex-Communists crossed to the other side when they saw him coming. They seemed to find it embarrassing meeting someone of such intellectual integrity who continued an active Communist. In time the party branch began to grow again and we hope that Maurice though he retires from his university post will still continue to encourage and help, though his major contribution will be, as it has always been, in his writings.

We look forward to many more years of activity, for Maurice Dobb at 67 shows how Communism keeps us young. But we also look back to the qualities from which so many people have learned. We have been taught by example rather than precept, by a continuous unassuming modesty but combined with it an intelligence that has no use for sloppy thinking or for what he once described as shabby behaviour in personal relations.

A stickler for scientific accuracy, an opponent of dogmatism, Maurice Dobb has always disliked demagoguery. A fellow Communist once described him as the impeccable Maurice, a tribute to his humanity and to his Communist behaviour.

Maurice Dobb— Communist, Economist, Historian

J. R. Campbell

THIS summer Maurice Dobb retires from his present academic post of Reader in Economics at Cambridge University. Most of his academic life has been spent at Cambridge, though he was for a time visiting Professor at the School of Economics in New Delhi, and during the war visiting lecturer at the School of Slavonic Studies. He has of course travelled widely throughout Europe and through the ex-colonial world in general and has studied their problems on the spot.

It would be entirely wrong however to regard him as mainly an academic, who, sheltered behind the defences of an ancient university, happens to have a scholar's interest in communism. On the contrary Dobb has always played a major part, as an open dedicated communist, in all the major political struggles in Britain in the last forty years. The student body at Cambridge played a part in all the major struggles of the period, the anti-war struggles of the early 1930s, aid for the unemployed marches, the great movements against Fascism, and against the Fascist war danger, and in the post-Second World War period the great struggle for nuclear disarmament. Above all throughout the period Dobb helped to show many students the relevance of Marxism to an understanding of the major events of the time.

Controversies

He had to engage in most of the major economic and political controversies, from the 1920s to the 1960s—and what controversies they were. He had to make the comparison between Marxist political economy and the neo-classical political economy then taught in the Universities as means of investigating capitalist society and as guide to action. Dobb saw Marxism passing in the estimation of academic circles from the stage when it was regarded as a rather outmoded system of political economy, hardly worthy of the trouble of being refuted, to the position of much greater respect with which it is regarded by the controversialists of the present day. For after all Marxism had something exceedingly relevant to say with regard to the great economic crisis of the 1930s; something that

could not be claimed for the neo-classical school before Keynes.

The controversies around wages have surrounded Dobb from the moment in which he went to Cambridge in the 1920s, in the midst of a great post-war capitalist offensive against the wage standards of the British worker, until the incomes policy controversies of the present day. His little book on *Wages*, published in 1928, has gone through ten issues, with of course emendations and one major revision in the process. Economic development both capitalist and socialist has always been at the centre of his interest and besides participating in all the discussions around these questions his major works have been written in relation to them. Dobb's main concern has always been with the great central economic and political themes of the day, and not with the peripheral questions which occupy so many economists most of the time.

Emergence of Industrial Capitalism

His first major work, written at the age of 24, was *Capitalist Enterprise and Social Progress*. Enforced leisure in H.M. Prison, Wandsworth, in 1925-26 gave me the opportunity of closely studying this work, which helped me to understand that the questions of how capitalism emerged within feudalism in England, how it did and why it did, were not the simple questions that I had imagined. Dobb returned to the same theme, as a mature scholar, in the publication of *Some Aspects of Capitalist Economic Development* in 1951. This provoked a lively controversy with the well-known American economist Paul Sweezy which ranged through several issues of *Science and Society*.¹

Marx in the third volume of *Capital*, dealing with the development of industrial capitalism out of simple commodity production, in a state which was still in the main feudal, had noted the two ways in which this process took place:

¹ The various contributions to this controversy were assembled in the booklet *The Transition of Capitalism to Feudalism*, Fore Publications, 1954.

"The transition from the feudal mode of production takes two roads. The producer becomes a merchant and a capitalist, in contradistinction from agricultural natural economy and the guild-encircled handicrafts of medieval town industry. *This is the really revolutionary way.* Or, the merchants take possession in a direct way of production. While this way serves historically as a mode of transition—instance the English clothier of the seventeenth century who brings the weavers, although they remain independently at work, under his control, by selling wool to them and buying cloth from them—nevertheless it cannot by itself do much for the overthrow of the old mode of production, but rather preserves it and uses it as its premise".²

Sweezy argued that Marx's phrase "the producer becomes a merchant and a capitalist" could mean that, "the producer whatever his background starts out as both a merchant and an employer of wage labour", whereas Dobb saw the emergence of small capitalists from the ranks of those engaged in petty commodity production, both in industry and in agriculture.

A Japanese professor who contributed to the symposium in the main supported Dobb saying that:

"one of Dobb's most valuable contributions to historical science is that he sought the genesis of industrial capitalists not amongst the *haute bourgeoisie*, but in what was taking form with the class of the petty commodity-producers themselves, in the process of freeing themselves from feudal land-property; that is, he looked for their origin, in what was being born from the material economy of the body of small producers; and therefore he set a high value on the role played by this class of small and medium-scale commodity producers; as the chief agents of productivity in the early stages of capitalism".

Dobb's emphasis on this group was that when they became employers of labour (on a small scale at first):

"they prospered greatly (as employers of labour) from the falling of real wages of the Tudor inflation; and smaller gentry and rising kulaks were organisers of the country cloth industry on an extensive scale. Evidently they were a most important force in the bourgeois revolution of the seventeenth century, providing in particular the sinews of Cromwell's New Model Army. Moreover the fact that they were is, I believe, a key to the class alignments of the bourgeois revolution; in particular the reason why merchant capital, far from playing a progressive role, was often to be found allied with feudal reaction".

Controversy on Wages

The usual dissertation on wages to be found in economic textbooks takes the facts of a class-divided society for granted, without showing any curiosity

as to how it came about that the majority of the adult population of a developed capitalist country appear on the market, looking for an employer, while a small group owning the means of production (or their managements), appear as the purchasers of the labour-power of the workers. Most bourgeois economists accept this transaction as a contract, in which both sides are able to bargain freely, and the result is as a whole equitable—so equitable indeed that the interference of any organisation, trade union, or even the State itself, was found to have harmful results, not only for the employers but for the workers themselves. Many economists came close to asserting that the laws of nature would be grossly interfered with, if there was any interference with this wage bargain. Dobb had to remind us that the proletariat, with no means of living except by selling its labour power to the employers, was created, over a century or so, by political as well as economic forces, which separated the petty producers—peasants and artisans—from their means of production and left the workers heavily dependent economically on the capitalists:

"Hence the labourer, because of his smaller economic freedom—his more circumscribed choice—is dependent to a great degree and in a more significant sense than the capitalist is on him; a fact that will have a fundamental influence on the wage-contract between the two. Such a dependence, economic and no longer legal, will be a dependence, not of a labourer on one particular employer, but of labourers in general on the whole class of employers and potential employers".³

This suggests caution in the use of the phrase "free collective bargaining". To stop the state, *à la* Stewart and Gunter, interfering with specific wage or salary bargains is good, but one must not imagine that the outcome is really "free collective bargaining"—which is precluded by the monopolist position of the capitalists as buyers of labour power.

Dobb conducted a sharp polemic against those economists who contended that wages could not really be influenced by trade union action and showed the possibilities of doing so in a number of ways. The views that he combated, not only in the thirties but since the Second World War, seem to be superseded in the writings of some latter-day economists by the view that it is precisely the success of trade unions in raising wages that accounts for the post-war malaise of British capitalism, and that this necessitates the imposition of state curbs on the unions. We need I think another study by Dobb of the working of wage bargaining in a State Monopoly capitalist society which has maintained a comparatively high level of employment, even when periods of recession are taken into account.

² *Capital*, Volume 3, page 393, Kerr Edition.

³ Dobb, *Wages*, page 8.

Bourgeois Political Economy

In a collection of essays on *Political Economy and Capitalism*, published in 1937,⁴ Dobb traced the development of economic theories from Adam Smith and David Ricardo through Marx and Engels to the neo-classical economists of his day. He was able to contrast these latter-day economists with Marxism, showing their basic differences in method and in outlook. The founders of the classical political economy—Smith and Ricardo—were concerned with clearing away the barriers to the full development of industrial capitalism, and with the reduction of the power of the land monopoly which they regarded as a barrier to that development. They regarded the growth of industrial capitalism as the greatest possible boon to the human race and sought to present it, objectively, as a functioning social system. Ricardo was concerned, in particular, with the distribution of the revenue between the three great social classes of capitalists, landlords and workers and how this came about in the form that it did.

Their doctrine was in some ways defective and Marx had to thoroughly work over it and correct it in the writing of *Capital* in which he was concerned with laying bare the law of motion of capitalist society. We had to find the source of the accumulation which enabled capitalist society to expand over the years. Smith and Ricardo had formulated a labour theory of value of a kind, but were unable really to explain how accumulation resulted.

If workers sold their labour at the market price how did a surplus arise, which was the source of rent, interest and profit? Marx showed that what the workers sold on the labour market, at its market price, was their labour power, which had the unique quality of creating a surplus for the employers over and above the cost of wages, and this surplus value was the source of rent, interest and profit. Throughout his life Marx had to contend with two schools of thought on wages—the first, comprising workers as well as capitalists—who contended that the workers were unable to increase their wages in real terms under capitalism, and he had to make clear to the second school that, no matter how well the workers were organised, they would be unable to push up their wages to such an extent that they could cut into surplus value and decisively reduce it.

Unemployment, Crises, Growth

Marx showed that capitalism in the course of development created a pool of unemployment—the industrial reserve army—which hampered the wages movement even in booms and was a terrific drag upon it in slumps, and which thereby imposed an upper limit on wage increases. The credit squeeze, so

familiar to us in stop-go, helps to create this pool of unemployment today as a drag on wages. Many of the Government's advisers today seem to be insisting that this pool must in the future be kept larger than it has been since the war precisely in order to help to ensure that wages do not rise as fast as formerly.

The classical political economists were never able to explain in the light of their doctrines why capitalism periodically plunged into economic crises. When it did they usually explained it as being due to some event external to the normal workings of the capitalist system. Ricardo adhered to the opinion that increased production in capitalism created its own market in the long run and Marx had to show just how it could nevertheless give rise to devastating crises.

The classical economists were also weak in their explanations of how the system could grow but they tried to see the system as a whole and their feet were solidly on the ground of capitalist reality. They were not afraid to show the class structure of society in operation.

In the last three decades of the nineteenth century the main body of economists in the capitalist countries adhered to various variants of the marginal utility schools. This type of bourgeois economics tended to smuggle the class structure of society out of sight and to play down the monopoly power of the capitalists in relation to the workers. It was not concerned with the question of how society came to be divided into contending classes, how the class structure perpetuates itself from generation to generation, how free competition gives way to monopoly, what is the origin of the economic crises which disrupt the economy, least of all, did it concern itself with the emergence of imperialism—both in its traditional and neo-colonial manifestations—as linked with the growth of monopoly.

Bourgeois economics dealt in the main not with relations of production and of classes in society. Its concentration was on market relations, how demand operates in deciding what shall be produced; how prices—including the price of labour-power—were formed first in a competitive market and then in conditions of monopolistic competition, how in consequence each group appearing in the market, the powerful organised monopoly capitalists, the workers organised and unorganised got back from the economy what they had put in. All this resulted not from state decrees but from the material operations of the market. If workers were in miserably poor-paid jobs, this was because they were in branches of industry not highly regarded by the market. If they wanted to escape from this sad condition they could go and find "a better hole" elsewhere.

⁴ *Political Economy and Capitalism*, Routledge, 1937.

Until Keynes successfully discredited some of its basic lines of reasoning⁵ bourgeois economics rather disgraced itself. Senior British economists supported the Treasury in its view, successfully defended throughout the 1920s and 1930s, that little or nothing could be done by the State, to mitigate, let alone drastically reduce, the unemployment that was impoverishing large sections of the people. In several chapters of his book Dobb subjects this type of bourgeois economics to an intensive criticism.

Building Socialism

The problems of building socialism in the Soviet Union have been one of the major studies of Dobb throughout his life as an economist and economic historian, who is also a committed Communist. No one in Britain is better acquainted with all the Soviet economic material. He first went to the Soviet Union in 1925 and has been there frequently since. As the Communist Party's representative at the Communist International, I had in 1930 to rescue him from the attention of some minor Soviet authorities in Central Asia, who were quite sure that no one from an ancient British university would visit their area for any good purpose. His second major work, *Russian Economic Development since 1917*, published in 1928, dealt with the period from the seizure of power in 1917 till 1927—taking readers through pre-war Russia, the Revolution of 1917, the period of "war Communism" down to the New Economic Policy (NEP) (1921-27), in short right up to the beginning of the First Five-Year Plan. The English-speaking reader is introduced to the difference between the Russian Marxist conception of socialism and that of Fabian gradualism in Britain. We note the patron saint of Fabianism, Sidney Webb, who in later life became an admirer of the Soviet Union, describing it as "a new civilisation" and writing:

"The British Socialist movement, which derives from Robert Owen, and (without its knowledge) from Bentham . . . at no time has been predominantly or even appreciably 'Marxian'. With hindsight one might ask, and where has that got it."

Present-day Marxists will note with some amusement that the prevailing opinion in the years immediately before the publication of this book was that, by adopting the New Economic Policy, the Soviet Union was well on the way to restoring capitalism. This New Economic Policy by giving increased scope to the market and to the individual peasant farms, would, many bourgeois economists believed, enable capitalism to grow out of petty commodity production, as it had done in the early

⁵ Far be it from me to suggest that even in its reformed state it is in any way trustworthy.

stages of capitalism elsewhere. True the commanding heights of the economy, the industries, such as they were, the monopoly of foreign trade, the financial system were firmly in the hands of the workers' state but many supporters of capitalism hoped that in the struggle then developing, the market, and the capitalist (kulak) representatives emerging from the peasant mass, would prevail over the State in control of the workers.

For years intense controversy raged inside the Soviet Union regarding the way forward. It embraced the great discussion on the role of the unions in Socialist society, which shook the party, in the months before the definite adoption of the New Economic Policy. It is interesting to note the fiercely autocratic attitude of Trotsky with regard to the unions (since some of his naive present-day followers have cast him for the role of a valiant democrat fighting against the bureaucracy). With regard to the New Economic Policy this volume makes clear the extraordinary intricacy of pursuing a policy of gradual advance to socialism, in a country where the overwhelming majority of the population were individualistic peasants. It was in this controversy, that opposition groups with Trotsky and Zinoviev at their head, drew together, with their policy of enormously speeding up the role of industrialisation and their conception of soaking the peasantry by increased taxation in order to provide the necessary resources for this. It was a policy which, if accepted at that moment, would have led to a premature attack on the "rich peasants" before the political and economic conditions had matured.

History of the Plans

Most of the developments dealt with in this book, are summarised in Dobb's later work, *Soviet Economic Development since 1917*, which was published in 1948, and of which the sixth edition, revised considerably, takes developments up till 1965.

In this book those who talk glibly of planning find all the necessary explanations of what planning really involves and the alterations in planning methods and techniques up till the present day where a great change is in progress in which more choice of what should be produced and how is being given to the individual factory or group of factories, and naturally to the consumers.

Dobb was one of the first to attempt to convey to intellectuals outside the Labour movement the tremendous task involved in commencing Socialist planning in the conditions of the Soviet Union in the late 1920s. In a paper read to "The Heretics" in May 1929 he sketched the background:

"The policy in Russia today intends to dispense with this aid [foreign financial aid], to reconcile rapid industrialisation with the Communist goal of

a classless society, where the economic polarity between those who live by their property and those who have no property live by working for those who have, shall be no more, and all, instead, shall figure as workers, communally owning the means of production, with which they work. The combination of these three elements in one policy, rapid industrialisation on the basis of socialist planned economy, and classlessness, is what makes the new Russian Revolution of today unique in history. And some idea of the stupendous character of this effort as applied to Russia, can be gained if one remembers that the old open-field system prevails over the major part of Russian agriculture; that 60 per cent of the pre-war population were illiterate; that some 60 different languages are spoken within the Soviet Union, some not yet possessing a script; that for instance the major part of the people of one republic, Kazakstan, is nomad, and that in parts of Turkestan, women still wear the veil and (until the present Government prohibited it) were sold in marriage like chattel slaves. What after all are the lives of a few of an effete ruling class, compared with historical tasks such as these?"

Soviet Economic Development deals with the growth of planning, outlining many of the problems on the way:

"Ought the goal of economic planning to be to steer the economy in whatever direction, and at whatever speed, the programme of the Soviet government dictated? Or should it, in the very nature of the situation, confine itself to enunciating the laws and tendencies which must inexorably be followed if economic crises and breakdown were not to result?"

"Put abruptly in this form, the antithesis is clearly seen, of course, to be unreal and absurd. To answer the first question with an unqualified affirmative would be to claim for the State divine omnipotence, and to assert the complete dethronement of economic law. To answer the second question in the affirmative would be to identify the Soviet economy with an anarchic *laissez-faire* economy, ruled by atomistic competition, and would be virtually equivalent to a complete negation of planning as an influence on the long-term trend of events. Any plan must in any form be a synthesis of forecast and directive. Like the process of history itself, it must necessarily be a blend of subjective and objective elements."

The first attitude to planning, of course, tended to reduce it to forecasting economic developments, and to stress how greatly the progress of agriculture influenced economic developments. This in the late twenties was to create for many active workers engaged on this question "the baffling sense of a closed circle of interdependent limiting factors to which all economic discussion seemed to lead". It almost reminds us of George Brown's "National Plan" where all discussion of the various projections for industry seemed to lead back to the deficit in

the balance of payments, with no real propositions in sight on how it should be eliminated.

However the Soviet way out of this dilemma was to attack the agricultural bottleneck itself by the drive for the formation of collective farms, which would put agriculture on a new and more productive basis.

"The system of economic planning in the USSR did not spring full grown from the head of Lenin as some people seem to have assumed. It had a history of growth and change over two decades, at some stages of tortuous growth; and certain historical prerequisites were needed, before economic planning could be anything more than partial or tentative—a fitful hand on the reins rather than a curbing and steering of the team."

"Questions to Reality"

In these terms Dobb warns the reader at the beginning of his chapter on "The Planning System" in *Soviet Economic Development*. The plans however carefully prepared had to be tested in operation, and modified in the light of practice:

"To start upon the plan is to put questions to reality (as a scientist does in his laboratory) which could not be answered in any other way. The way that the programme shapes when translated into practice gives fresh experience and new data to the planning organs which need to be continually alert, not only to receive and sift new data, but to adjust the shape of the plan as it proceeds, in whatever way this closer acquaintance with reality shows to be required. Thus the plan, like a living organism, can be made to grow, and modify its shape, as part of its activity."

From Dobb's descriptions of the many and varied problems confronting the Soviet government it is clear that it had to move in the light of certain imperatives such as the maximum development of heavy industry (particularly after Hitler came to power), the breaking of kulak resistance, the accelerated collectivisation of agriculture, and, in view of the scarcity of cadres, the close supervision of most activity from the centre.

In the recent period there has been considerable criticism of the shortcomings of the way that centralised economic planning has been operated in various Socialist countries, and, as usual, capitalist critics see in the reforms undertaken in those countries a confirmation of their long cherished wish for visible signs that Socialist economics were returning to capitalism. They heard the word profit being mentioned, and that was regarded as proof that there was a return to the fold. In fact it was proof that the Soviet Union and the other countries had entered a new stage in their development and that new planning methods particularly between the centre and individual enterprises or groups of

enterprises had to be devised. But this emphatically does not mean that such changes should have been introduced at a much earlier period, nor that the Soviet Union—by ignoring the advice of economists in the capitalist world, had been wandering around in an unnecessary maze. (Though in my opinion some of the imitations of Soviet planning by other socialist countries were, to say the least of it, unnecessary.)

Old and New Methods of Planning

Dobb gave his opinion of the changes, particularly in the Soviet Union, in a lecture delivered in January 1967.⁶ The highly centralised planning of early years he argued, was necessitated in many cases by the need to make the most careful use of such political, technical and scientific cadres as existed, even if some of them were infected by their capitalist outlook and prejudices. Hence from the first a very high degree of centralisation of management and of planning activities was an absolute necessity—and this inevitably limited initiative below. Both administrative pressure and incentives were necessary to achieve results, but, in early stages, administrative pressure was predominant. Whatever disadvantages this high degree of centralisation was to create later, it eliminated the possibility of the growth of capitalist elements in agriculture and created a powerful heavy industry (including an armaments industry) without which the Soviet Union would never have emerged successfully from the Second World War, and would never have become the second industrial country of the world. It is possible using hindsight to say that this or that modification could have been made in planning methods, or that this or that alternative policy in relation to agriculture should have been adopted. However close an analysis of the actual situation that had to be confronted, the main lines of what were done in the first phase of planning could not have been very much different, even allowing for the economic consequences of the repression in the Stalin period.⁷

The first phase of planning had to be concerned with the rapid extension of the productive apparatus of the countries. It was not merely a case for developing the means of production, which could then be set immediately to the production of consumer goods. The country had to be covered with a network of modern industries. The first factories manufacturing means of production had to be largely used to create still more factories manufacturing means of production and of communication before proceeding to the mass production of every variety of consumer goods. There was, before the Second

World War, no limiting factor like labour shortage, as masses of peasants from the collective farms were being recruited to industry. There was a high rate of growth of productivity. Agricultural workers of low productivity became industrial workers of relatively high productivity.

Increased Autonomy

That stage of building up a powerful industrial apparatus and limiting increases in the supply of consumer goods has been over for a number of years. It is now possible greatly to increase the supply of consumer goods not only in quantity but in quality and variety, and to bring the consumer and his wants closer to the enterprises producing consumer goods. It is equally necessary to lay increasing stress (in view of present labour shortages) on productivity—on production per worker—and this means giving direct and better incentives to workers and managements to make better use of existing equipment and to undertake innovations which will lead to higher productivity and through this to a higher all round standard of life. To some “left” critics of the Soviet Union “material incentives” appear to be “dirty words”—as if some wicked capitalist practice were just being introduced into the Soviet Union. This and not the return to private ownership of the means of production is what some Chinese Communists evidently regard as “the restoration of capitalism”. In practice of course, material incentives, various piecework systems, have been in operation in the Soviet Union since the days of Lenin and have been widely utilised.

The question is “incentives to do what?” In the past the incentives were often based on the quantity of commodities produced rather than their quality and acceptability to the mass of the consumers. It paid managements to do this and to keep production going on the basis of the existing equipment. The widespread introduction of new equipment would involve some interruption of the production process and was not undertaken. There were incentives but they were incentives of the wrong kind.

The new developments presuppose giving the enterprise more autonomy in deciding what to produce and to encourage it to make profit in supplying its customers with a greater quantity, a better quality and a wider variety of consumer goods. The profit—which is, of course, not private profit accruing to private owners of the means of production—is the basis for providing higher incomes to workers and managements, particularly encouraging managements to pay more attention to the possibilities of obtaining the best possible equipment for the job they are doing. Managements are also encouraged to get as much as possible of the resources they require direct from the enterprises

⁶ *Recent Economic Problems and Changes in Socialist Countries*, Marx House, 2s. 6d.

⁷ This at any rate is my opinion.

producing them and not waiting on planning allocations.

If I understand Dobb's writings on the planning question⁸ he is for giving greater scope to the market but not allowing it to dominate.

"What is evidently needed is some blend of centralised direction and steering with decentralised decision-taking; and this in turn must mean some blend of planning and the market, in the sense that planning utilises the market mechanism, with market prices and consumers' choice between the shop-goods available, while at the same time treating that mechanism as subordinate to general planning policies, without allowing it to dominate the latter. It must not let the tail wag the dog."

In his *Economic Growth and Planning* (1960) he firmly argued the superiority of Socialist planning as a promoter of faster economic growth compared with the market under monopoly capitalism, or state monopoly capitalism with the so-called indicative planning. This work is a refutation of market worshippers and indicative planners alike and is a powerful contribution to the discussions now proceeding throughout the Socialist world and in the underdeveloped countries. In the lecture already mentioned he expressed some doubts as to the Czech proposals of allowing the enterprise "considerable latitude in taking investment decisions out of funds at its own disposal, supplemented by bank credits (which would of course carry an interest charge) such as investment in modernisation and reconstruction, and even extension of the plant". In the Yugoslav model (here I express my own opinion) the market appears to become the dog and any state regulation a rather erratically working tail. If the various enterprises start from a position of inequality (some highly modern, some fluctuating about the average of efficiency, some definitely sub-standard), there can be wide variations in performance, which in a number of cases could relate more to the equipment which the workers have at their disposal, than to the efficiency of a particular management or labour force. In such a situation there could be a growing inequality in the remuneration of workers in different plants, that is quite unrelated to any contribution they may have made to efficiency. To give scope to the market, until it reaches a point of dominating the whole situation, may lead very far indeed from socialist objectives.

There are obviously questions that are much better handled at the level of the enterprise than at the planning centre, leaving the latter greater freedom to deal with what Dobb calls "the

major framework to the development plan".⁹

One of the great advantages of decentralisation, in many ways, is that it brings the workers in an enterprise closer to the point of decision. The enterprise is their enterprise in a more immediate sense than before and there is a visibly closer connection of their interests with that of society:

"Situations in which initiative from below is encouraged and appropriately blended with planned co-ordination from above; in which democratic participation is combined with the 'collective discipline' that modern productive techniques demand—this may serve to develop these new attitudes, leading to a level of 'collective consciousness' such as in an individualistic exploiting society (with its pay-packet bias) were unknown."

Underdeveloped Countries

The experience of economic planning in the Soviet Union proved that unless there was a planned break-out of the existing market situation, no large-scale decisive growth could be achieved. To wait upon the expansion of agricultural production and agricultural experts before attempting large-scale planned industrialisation would have led to a stagnation such as would have imperilled the very existence of the revolution itself. Yet the idea of relying, above all, on the innate tendencies of the economy is being sedulously preached to the underdeveloped countries today. This is what Dobb sets out to combat in his *Economic Growth and Underdeveloped Countries*.

Many capitalist theorists (some from countries like Britain, which have had no conspicuous record of economic growth for a century or more) have hammered in the idea of making full use of one's most plentiful resource—if it is labour, then the crux of economic policy should be to ensure that it is fully employed, even on the basis of pick and shovel techniques. That there might be some increase in the gross national product by such methods is beyond the possibility of a doubt but it provides no perspective for any advance out of the situation of general backwardness.

There must be in any fairly large developing country a policy which aims at maximising the "growth potential", that is increasing the investment in industries devoted to improving the means of production:

"A policy of maximising the latter even if it is at

⁹ It is clearly necessary to reduce the unnecessary growth of administration at the centre. It is equally necessary to watch it lower down. Those who imagine that decentralisation and market competition can by itself reduce bureaucracy should take a good look at the proliferation of unnecessary administration not only in the state apparatus but in the larger companies. Where does advertising come in here?

⁸ *Economic Growth and Planning*, Routledge, 1960; *Economic Growth and Underdeveloped Countries and Argument on Socialism*, both Lawrence & Wishart.

the expense of making immediate output and employment smaller than they would be under an alternative policy, will enable both output and employment (and hence consumption) to grow more quickly, and before long to be larger than they would otherwise have been at such an early date. *The point is that a smaller share of a total that is growing fast can very soon become larger than a bigger share of a total that is growing more slowly*.¹⁰

Underdeveloped countries comprise states of all shapes and sizes but as Dobb explains:

"The argument about investment priority for heavy industry is best thought of applying to fairly large countries and to those as large as China, India or the USSR without any qualification; or else to a group of smaller countries, say in Africa or Asia, co-operating together in their development plans, as the Socialist countries in Eastern Europe are now doing."

Many Other Works

This sketch of Dobb's published works is obviously incomplete. There are many important lectures and articles which must be read.¹¹ We liked particularly the article on "Historical Materialism and the Economic Factor", which appeared in *History* in 1951, and which not only corrects some misunderstandings of Marxism, current not only amongst bourgeois thinkers, but amongst vulgar Marxists as well, a species fairly numerous in Great Britain and America. The lectures on Marx (1942) and on Lenin (1939) are masterpieces of exposition

¹⁰ *Economic Growth and Underdeveloped Countries*, page 48.

¹¹ The representative selection will be found in the book *On Economic Theory and Socialism*, Routledge, 1955.

and compression. Bernard Shaw's relation to Marxism is treated in an article, originally published in 1946, in a volume of essays commemorating the dramatist's 90th birthday. Despite Shaw's fierce denunciation of the workings of capitalism, his distrust of the working class as an agency of social transformation stands out in all he wrote. Here also will be found the discussions amongst economists as to the possibility of rational economic calculations in a Socialist society, which singularly enough seem to have been conducted without much reference to the actual problems faced by the Soviet Union in its take-off into planned industrialisation. One feels that some of the economists holding Socialist views in general, were too closely influenced by bourgeois economic theory and too ill-grounded on what was actually taking place to have given any light or guidance to those who were actually grappling with the problems.

It is remarkable that Dobb, a known Communist, survived in an academic post in Cambridge in the 1920s and 1930s. (We lack confirmation of the story that George V expressed a certain amount of alarm at learning he was there at all.) Though Dobb has never complained, we would think that his political background impeded his economic advance so that today he is probably more widely known amongst economists in other parts of the world than he is in Britain. It would be beneficial to all party members to make an extended use of what Dobb has written,¹² perhaps as an encouragement for him to write still more. All of us should express our admiration for him as a dedicated Communist, and a brilliant economist and economic historian, and wish him many fruitful years.

¹² We suggest that beginners should start with the three recent Lawrence & Wishart publications.

Capitalist Development: Some Historical Problems

E. J. Hobsbawm

WHEN Maurice Dobb first published his *Studies in the Development of Capitalism* there was hardly any interest in the history of capitalism among British economists, and not very much more among historians, other than those who were under the influence of Marxism. The tradition of liberal economics which dominated theory in this country was largely a-historical. For the early champions and supporters of capitalism, it was not so much a specific socio-economic system, which emerged from earlier ones and would in due course be superseded, but the only form of economic rationality and progress. Until the country had been industrialised and its policy and institutions made subservient to the needs of capitalism, they were obliged to take an interest in at least some historical problems, such as those of the conditions and obstacles to economic growth in its capitalist form. From the middle of the 19th century until the slump between the wars they took even these for granted. The past merely illustrated the eternally valid propositions of economic theory or what happened when they were not understood. It was, one might say, a museum of policy errors or insights and not a pattern of social development. Mostly it could be left to the historians.

Historians and Capitalism

The historians had taken a much more persistent interest in the development of capitalism, and their ranks had been reinforced since the last quarter of the 19th century by those academic economists (mostly critics of the prevalent orthodoxy of Free Trade and Laissez-Faire liberalism) who insisted on a historical method, but who were forced out of the main academic enclosure of "economics" and into the self-contained field of "economic history" by the predominance, at least in the British tradition, of the a-historical theorists. Speaking generally, both a school of Conservative economic historians (e.g., Cunningham, Ashley, Knowles) and a line of left-wing Radical historians (e.g., Thorold Rogers, Toynbee, J. A. Hobson, the Hammonds and Tawney) thought and wrote much about the historical problems of capitalist development in the period from 1880 to 1914, stimulated both by the first signs of decline and breakdown in the British economy, by the emergence of an ideologically

independent labour movement, and by the obvious inadequacy of the policies based on the prevalent economic orthodoxy. On the European continent this trend was strengthened partly by the inadequacy of the British theory as a guide to, say, the industrialisation of Germany or Russia, and even more by the need to counter the theory of Marxism, which inspired increasingly powerful mass parties and movements.¹

However, by the end of World War Two, this tradition had apparently exhausted itself in Britain. The general tendency of academic historians was to shy away from large syntheses and broad interpretations, and to concentrate instead on narrow monographs.² The prevalent method of arguing against the Marxist historical interpretation was no longer to accept the questions but to seek alternative answers, but to deny the validity of the questions altogether. There was no problem of the historical development of capitalism, because capitalism had always existed—were there not merchants in ancient Egypt, bankers in 10th century Arabia or a hired force of wage-labourers on medieval estates?—or because there had never been an industrial revolution, but only accelerated growth, or for other similar reasons, which strike most of us today as feeble debating-points. A view of historical evolution might suggest that it would lead not to a continued or improved capitalism, but to its end; the admission that there had been revolutions in the past might encourage them to happen in the present. In the remoter periods of the past, the exploration of what we would call the historical problems of capitalist development continued under other names, notably in the field of medieval agrarian history, which made considerable progress between the wars.

¹ The influence of Marxism, or more precisely of the need to give non-Marxist answers to Marxist questions, is very evident in the eminent central-European historical economists and sociologists such as Max Weber, Schumpeter or Sombart. They did not formally call their works a "non-communist manifesto" (the sub-title of W. W. Rostow's *The Stages of Economic Growth*, 1960), but that is what they were trying to write.

² This phase of historiography has been discussed in E. J. Hobsbawm, *Where Are British Historians Going?* (*Marxist Quarterly* 1952).

In more sensitive fields there was stagnation and regression. Little was added to our knowledge and understanding of the agrarian problems of the 16th century and the enclosures that had not been known in 1914. Something was actually subtracted from our knowledge of the industrial revolution. Professor Ashton still wrote a small book under that title in 1948 trying to explain it away, insofar as his erudition and scholarly conscience would let him, but the general drift of his type of approach emerged a few years later in his *Economic History of England: The Eighteenth Century*. This volume actually managed not to mention the industrial revolution at all.

Dobb's "Studies"

Dobb's *Studies* therefore appeared in 1946 as an isolated sport. The economists, while they appreciated the analytic ability of the writer, could do little with his historical material: they pushed him tactfully into the historical shelf. The historians did not much know what to do with him either: they pushed him on to the marxist shelf. On the whole both neglected him. This was not an uncommon fate for marxist works at this time. (It befell another brilliant and now neglected historical work which appeared in Britain in 1945, the late Karl Polanyi's *Origins of Our Time*.) But in fact Dobb's work, so far from being isolated and eccentric, was the first sign of a revival in the historical study of capitalism, which has now put the problems of economic and social development squarely into the centre of the social sciences. This revival has affected both marxists and non-marxists. The marxists were immediately and directly stimulated by Dobb's work, as witness the well-known international discussion arising out of it in the early 1950s. The non-marxists found themselves forced to reconsider the history of economic development because that is what old and new regimes in the world of the 1950s clamoured for. Though they often began with a marked bias against the marxist, or indeed any other historical interpretation, they were also eventually obliged to recognise the relevance of the problems posed by Marxists, even when they were reluctant to accept their solutions.

The historical development of capitalism is therefore today a problem whose importance is recognised by all serious scholars. Its study has also been advanced among marxists. This may therefore be a suitable moment to sketch some of the specific questions which arise in the course of this study, from the point of view of a historian. The points of view of the economic or sociological academics are not quite the same, but in fact it is increasingly clear that their studies only make sense when set inside a historical framework.

The Development of Capitalism

The first such question is, whether the development of capitalism has been unique in history or not. Some arguments by anti-marxists have suggested that it is universal, and a familiar over-simplification of the marxist interpretation has suggested that, at any rate, the tendency is universal, so that *all* societies throughout history can be placed on one step or another of the same single stairway leading from primitive communism via intermediate socio-economic systems to capitalism and socialism, though capitalism can be by-passed by revolution. However, while it is evident that there is a great deal of uniformity in human socio-economic development, and while the crucial relations of production and exchange, being limited in number, tend to occur in many different historical contexts,³ the only historical example of a *complete* indigenous progress from primitive society to industrial capitalism is that which reached its climax in the Industrial Revolution of the 18th-19th centuries. It is not impossible that a similar development could be traced in Japan, whose form of feudalism was, as most students agree, surprisingly similar to the West European. Few would wish to deny that, under certain circumstances it *might* have taken place in other parts of the world, or indeed everywhere; but it did not.

Moreover, it is now clear that even in Europe the development of capitalism was not a simple and unbroken process, but a series of starts and stops (or rather, of developments producing serious crises and retreats). The so-called "feudal crisis" of the 14th-15th centuries and the "17th century crisis", which have attracted the serious attention of historians since the late 1930s and early 1950s respectively, are examples. Capitalism did become a world phenomenon, or at least the dominant system in the world economy (which it largely created), but only by spreading outwards from a particular region of Europe.

Uneven Development

Our problem is therefore that of a universal tendency which is only fully realised in some parts of the world and at some times. It is, to use Lenin's fruitful term, the problem of *uneven development*. This raises a second crucial question, concerning the forms and mechanisms of this unevenness. This is not identical with the question why some societies apparently did not (until the 19th and 20th centuries) develop beyond certain kinds of socio-economic organisation and technology, though this is also

³ For instance, the relation of what Marx called "domination" and subordination" between lord and dependent peasant, or the specialised function of the merchant, or even the relation between employer and wage-labourer.

important. (It is certainly not due to any innate "backwardness" of some peoples, and probably only rarely due to a social mechanism favouring unchanging, static societies. There are few if any recorded societies which are genuinely static or impervious to technological innovation. All societies change, but their change only rarely produced the conditions for the development of capitalism.) The problem is rather that of the interaction between societies at various stages of development.

One aspect of it, which is of particular relevance today, is the development of a "dual world"—i.e., today of the "developed" and "under-developed" areas. Another is the familiar problem of the relative advantages and disadvantages of early development within the advanced economy.

To take the first aspect. Though industrial capitalism only "broke through" initially on a relatively narrow front—western Europe and the USA, and within this region, Britain—in fact its history cannot be written simply in terms of Europe, still less of any single country. Capitalism from the start sought to create its world economy, though until after the industrial revolution, or perhaps more accurately until the era of imperialism, this was not really global. Until the end of the Middle Ages (as defined in our textbooks), this creation was limited by the relative economic and political feebleness of the "West". It was economically too weak to dominate the major international currents of trade (e.g., Europe needed Eastern goods or African gold far more than the East and Africa needed anything from Europe), and politically too weak to conquer more than a few Continental territories and Mediterranean islands.

From the 16th century on, however, this changed and the regions of developing capitalism could establish three major zones of economic dependence, formal or informal empire: the Americas, directly conquered and administered, the "East", initially exploited by maritime operations, controlled trading posts and later partly (as in India, Ceylon and Indonesia) by direct occupation, and agrarian Eastern Europe, which became a major supplier of food and raw materials for the urbanised and developing West. These dependent regions were essential to capitalist development, but did not undergo it. On the contrary, and with the exception of some small patches of European settlement, they were "re-feudalised", turned into plantation economies on the basis of slavery or forced labour, or otherwise made complementary to the "advanced" economies. As we know, industrialisation turned the entire world into a potential colony or semi-colony of the "advanced" capitalist sector, and the era of imperialism and monopoly capitalism reinforced the divergence between the two sectors of the world.

Internationally speaking under capitalism it was always as unrealistic to hold out the hope that all countries could follow the model of Britain, France or the USA, as it was to tell the workers that they could all become industrialists. "

World Capitalist Economy

In terms of historical research this raises, it may be suggested, a number of questions. There is, for instance, the actual growth of the capitalist world economy, which is both extensive and intensive. At what point does the impact of the world market become "deep" enough to transform a non-capitalist economy into a dependent economy in which most of its people are involved (e.g., by turning its agriculture into an export monoculture)? There is the converse problem of how this process affects the developed capitalist economies. How far, given the relative sluggishness of this process before the industrial revolution, does it intensify the unevenness of capitalist development. Thus it has been suggested that in the 16th-18th centuries the impetus for industrial revolution could be generated only in one (or a very few) countries, which succeeded in capturing the greater part of the "capitalist world market" as it then existed. If this is true, then uneven development even within the "advanced" economic regions was the condition of any capitalist progress. A third question concerns the unevenness within the dependent world sector, which is often loosely given a single label ("colonial", "Third World", etc.) though it plainly consists of countries at very different stages of social and economic development and with very different structures. Granted that the transformation of "under-developed" into a "developed" economy is very difficult and rare within the framework of capitalism, there are still puzzling variations in the evolution of otherwise comparable economies within this sector; for instance, Argentina and Australia.

Industrial Revolution

This brings us close to another group of questions which are today preoccupying both Marxists and non-Marxists. These concern the transformation of capitalist development into industrial capitalism, i.e., the industrial revolution. Earlier studies in this field tended to concentrate on the development of the conditions for industrial capitalism, e.g., the separation of the peasantry from the land (i.e., the creation of a potentially "free" labour force), and there is no doubt that capitalist, and therefore capitalist industrial development is inconceivable unless certain economic, social and technological conditions are first met, or are in the process of being met. It may also be argued that if they come into being, then sooner or later, somewhere or other, the breakthrough to industrial capitalism will occur.

Given the process of European development, an industrial revolution may have been inevitable, though not necessarily in Britain and in the second half of the 18th century. This is possible, and indeed probable, but still leaves much to be explained. As has already been suggested, it does not explain *automatically* why it occurred in Britain (and not in, say, Germany) and in the late 18th (and not in, say, the mid-16th) century. Nor does it automatically explain the differences in national development between the countries of industrial capitalism, e.g., the different roles of the state in this process. Nor does it explain why (as US experts constantly note with unjustified surprise) some countries which by their calculations contain all the conditions for a capitalist "take-off", fail to become industrially airborne.⁴

Moreover, a failure to distinguish clearly between the conditions for capitalism and the actual process of industrialisation under capitalism, may suggest that this process was much smoother than it actually was. Let us take for example the much-debated question of the formation of an industrial proletariat. This did not take the simple form of expropriating peasants and other small commodity-producers and then (or simultaneously) absorbing them into employment in the industrial and urban sector of the economy, allowing for the maintenance of a "reserve army". In Britain it would seem that in the period from, say, the end of the 18th to the middle of the 19th century, the process of proletarianisation was rather faster than the capacity of the new capitalist industry to absorb the potential proletarians; hence during this period the growth of an abnormally large pool of the unemployed and semi-proletarians in the cities and industrial areas, and of concealed or open unemployment in agriculture. The well-known scholarly controversy about the social effects of "enclosures" arises precisely because it is plain that for two generations only a part of the proletarianised rural surplus population was absorbed into the industrial sector.⁵ The reasons for this are not clear and require more research.

On the other hand it may be suggested that from the 1840s until World War I British capitalism (which was by then being reinforced by capitalist development elsewhere), developed a far greater capacity to absorb labour into the industrial sector than before or since, thanks to the massive growth of industries which, in the prevailing and rather old-fashioned

technology, required large quantities of relatively untrained workers. Coal-mining, transport and building are examples. The male labour force in these industries rose about twice as much in the second half of the 19th century as the total labour force. This historically abnormal capacity of capitalism to provide employment acted, both nationally and internationally as a political safety-valve. It certainly drew the sting from the old Luddite argument that mechanisation diminished employment. But it must be remembered that this argument was plausible before the 1840s, when in fact industrialisation did not create corresponding openings for employment, just as it is not implausible in the era of automation, when industrial progress no longer necessarily creates disproportionately labour-intensive occupations.

The modern situation in many parts of the underdeveloped world is once again that of a massive "flight from the land", creating a vast *potential* proletariat huddling in shanty-towns and slums in the rapidly growing cities, but very evidently only to a small extent employed in industry, or any other identifiable regular occupations. In the 19th century the typical source of power (coal) could absorb more than a million men in a single country; the corresponding 20th century industries (oil, natural gas, electricity) absorb a few scores of thousands. The "proletariat" in newly industrialising countries is consequently often a favoured stratum within a vast and miscellaneous mass of the "labouring poor".

Gradualism or Revolution?

A third set of questions, connected with the second, may also be briefly suggested. They concern the problem of balanced as against unbalanced development, of gradualism against revolution. It is evident that the actual development of the first industrial capitalist economy proceeded by industrial revolution (i.e., not simply by an "accelerated change" but by a relatively sudden transformation) and that it was not balanced, but proceeded by a disproportionate advance of certain "leading sectors", such as cotton in the late 18th century, and a relative neglect of others, such as—until a generation later—iron and steel. The question is, whether this was a necessary process for capitalist industrialisation or, as recent

⁴ In most countries of the 20th century, as we have seen, there is no reason to expect *capitalist* industrialisation to be successful. Non-capitalist methods must be used: Nevertheless, there are some cases in which the conditions for capitalist industrialisation may still be regarded as present, but capitalist development is lagging, limited to regional enclaves, or abortive.

⁵ Let us note in passing that the anti-Marxist contention that this was because "enclosure" created more jobs in agriculture than it destroyed, is wrong on two counts. First, because even if true, it does not deny the transformation of rural cottagers and small producers into a rural *proletariat*: second, because the rising demand for labour in agriculture was purely temporary. After 1815 nobody denied that the agricultural proletariat in large parts of England was grossly underemployed, or actually unemployed. Of course, "enclosures" were not the only reason for this.

experience may suggest, for the initial industrialisation of any underdeveloped country.

It can be argued that it was necessary in both cases, for economic and social reasons of various kinds, some of which apply only to capitalist industrialisation, some which apply more generally to all underdeveloped countries (including the pre-industrial western ones). The conditions of 18th century capitalist development are no longer present today, and therefore the reasons why consumer-goods industries were more likely to pioneer industrial development in a market economy than capital goods industries, are only of academic interest. On the other hand the conditions of underdevelopment are very common, and therefore the problem of concentrating relatively scarce resources strategically, or of achieving the shock effect which can impart dynamism to a traditional or backward society, are very practical. In the industrial development of capitalism their solution was unplanned, indeed often unconscious. In non-capitalist industrialisation they are planned and not subject to the limitations of private enterprise. Yet if ever the history of capitalist industrialisation shows that industrial revolution and unbalanced development are indeed necessary, the lessons for our time are not negligible.

Outdated Models

The questions suggested here—and they are merely a few out of many possible ones—are essentially based on the attempt to illuminate the history of capitalism by present-day experience, and conversely to illuminate the problems of economic development today by the study of capitalist history. This confrontation is natural enough and it is equally natural that today the major historic questions should arise from it. But of course these questions can neither be asked nor answered profitably, unless we recognise the fact that the methods of economic development pioneered by the leading capitalist countries in the 18th and 19th centuries are basically inapplicable to the emergent peoples of the 20th. Neither Manchester nor Duesseldorf will ever again be the model for industrialising countries. Even Detroit has today only certain technological lessons, probably of diminishing importance, to teach the rest of the world. The chief conclusion from capitalist development that the historian can draw is, that it was probably never a generally applicable model, and has today ceased to be (except in some specialised aspects) a very useful one.

The Scientific-Technical Revolution and the Productive Forces of Modern Capitalism

Ron Bellamy

I. INTRODUCTION

FROM his earliest work *Capitalist Enterprise and Social Progress* to the important chapter on planning in his *Essay on Economic Growth and Planning* (1960), Maurice Dobb has investigated and illuminated the interaction of the productive forces of society with the form of property ownership and the mode of appropriation of the product. In *Studies in the Development of Capitalism*—published in 1946—he wrote of the “obsession of capitalist industry in its latest phase with the limitation of markets”, adding: “for this obsession there seems also to have been a deeper reason connected with the nature of modern technique. That certain of the technical changes in the productive forces which have characterised the 20th century and especially the period between the wars . . . may have effected radical alterations in the whole setting of the economic problem and in the relation of the capitalist entrepreneurs to it, has more rarely received attention” (pp. 357-8). In more recent years he has been among the first to insist on the important implications for economic development of the new productive forces brought into being since the Second World War by the scientific and technical revolution. It is the development of the productive forces in this period that I propose to examine here, along with some of their implications.

Two disclaimers may be in order at the outset. I would be the last to suggest, especially in writing for the present occasion, that the productive forces are the only, or indeed always the primary, agent of socio-economic change. Our own period is one of rapid political changes, of large-scale intervention by the superstructure of society in its economic life. Certainly, practical requirements—especially in the short run—require that one studies the expanded reproduction process of capitalism as the resultant (as well as the cause) of *all* the contradictions within that system and between the two systems. But the longer the perspective taken, the more decisive is the part played by the productive forces—in two respects: first, the inability of the *economic* structure of monopoly capitalism at this stage of its development, alone and unaided, to nurture the new pro-

ductive forces, and the consequent resort to increasingly massive political intervention as the only means of transforming the production relations sufficiently to permit of the profitable employment of those productive forces; second^L—and this is clearly not the least of the causes of state intervention within capitalism—the increasing ability of the economic structure of socialism, ever less hampered by its historical deficiencies, and decreasingly aided by the forms of political force which marked the period of administrative methods in planning, to utilise and advance rapidly the offspring of the scientific technical revolution.

Hence the importance of changes in the productive forces is apparent in two key areas. Within monopoly capitalism itself, the need to resolve the new contradictions generated by the new productive forces has forced into the political arena questions which were hitherto of an economic character, and thus raised the level of struggle and the level of consciousness of the popular forces.

But the balance of the internal class forces within monopoly capitalism is influenced also by the balance of forces between two economic systems. That balance of forces in the last analysis depends upon the relative rates of growth of their respective productive forces. Hence to the fear of too large a capacity to which Maurice Dobb drew attention, there is added a new fear—the fear of a capacity too small to balance that of socialism. A new Faustian conflict within the breast of Monopoly Capital!

II. THE SCIENTIFIC AND TECHNICAL REVOLUTION

In capitalist and socialist countries alike it is recognised that among “the distinctive features of the new era of capitalism since the second world war . . . is the accelerated pace of technical progress” (Shonfield: *Modern Capitalism*, 1965, p. 63). Two leading German Democratic Republic planners wrote in 1964: “The long-term plan must start from the trends of scientific and technical development” (Apel and Mittag: *Planmäßige Wirtschaftsführung und ökonomische Hebel*, Berlin, GDR, 1964, p. 6).

Both express the very real fact that the productive forces have taken a sharp leap forward. And just as in the earlier technical revolution of the 19th century one could identify leading sectors in the overall advance (with consequent changes in the mutual dependence of its parts), so in our period a specialised part of the productive forces takes the lead, namely scientific-technical progress itself. Its growth in turn depends crucially upon the quantity and quality of the output of the educational system and, more subtly but no less crucially, upon the ideology which pervades both the educational system and the field of science itself.

In a world of two competing socio-economic systems the decisive factor in the longer run will be the relative abilities of their respective socio-economic structures to act as a fertile matrix both for the embodiment of existing knowledge in production and for the further advance of knowledge. Overnight the 1957 Sputnik brought to the USA realisation of the crucial role of science and scientific education in economic growth, added political urgency to the already existing motives for studying the history of science (as a key to uncovering the determinants of scientific advance), and gave birth to a new branch of applied economics, the analysis of "Investment in Human Beings".

The Growth in the Division of Labour

First let us look at the development of the productive force science and technology itself. Certain key facts stand out.

The process of production of new knowledge is taking on an increasingly social character. There is a rapid growth in the division of labour and therefore an enhanced need to unify the specialised labours into a social whole through the exchange of products both within the sector of Research and Development¹ and, if the fruits are to be embodied in production, exchange between Research and Development and production.

Secondly, an increasing proportion of social resources has gone into R&D, and not only in countries where military activity has been a principal influence. The same is true of expenditures on education and, within education, those upon education of scientists, technologists, and auxiliary workers.

Thirdly, within the R&D field specialisation is growing fast. This has not, as in production in the past, led to job simplification and a shortening of the period of training. Indeed the ratio of postgraduates to those studying for a first degree is rising. The reason is clear. The planned product of R&D

¹ (Henceforth we shall refer to this sector for short as R&D, an abbreviation widely used in all modern discussion and official publications.)

activity is precisely the new, the original, the different, whereas modern mass production is marked by standardisation, repetition, uniformity.

Fourthly, the complexity, size and costliness of apparatus grows with deeper penetration into nature. In 1954 Bernal wrote of a contemporary particle-accelerator which cost £2 million: a decade later Powell wrote of the proposal to build, over a period of eight years, a nuclear research installation costing £100 million. If scientific research is expensive, development work is more expensive still and absorbs about two-thirds of all resources used. It grows faster the faster it is aimed to put the fruits of science into production.²

Fifthly, because R&D grows faster than production, its labour force of scientists, technologists and auxiliary workers forms an increasing share of the total labour force.

Unification of Specialised Labours

Consider now the requirements for the unity of the specialised labours of the different sectors of R&D into a single process through the exchange of their product, new knowledge.

Exchange of knowledge both within and between research teams is a condition for continued social labour. With the growth in specialisation the problem of communication, both as to volume and speed, becomes more complex. From the beginning of the 19th century up to the outbreak of the Second World War the number of scientific journals rose from 100 to about 33,000; in the last twenty-five years it has grown threefold to more than 100,000. It is clear why the Commission of Co-ordination for Scientific and Technical Research of the socialist CMEA speaks of the "importance of broader production specialisation and closer mutual advantageous scientific and technical co-operation on the basis of the international division of labour . . . There is still some dispersal of effort and duplication" (*International Affairs*, September 1965).

R&D are crucially dependent upon supplies of high-level manpower of the right type and quality at the right time. This is universally recognised, and since gestation periods in its production are long, the need for planning is also recognised. What is less recognised (though the increased interest in the history of science suggests growing awareness) is that creativity in the sphere of production of ideas is

² What is true of research is true even more of the more expansive work of development, without which theoretical work has limitations, and without which it is not possible to transform laboratory discoveries into production processes. "There is a limit" writes the President of Boeing Aircraft, "to how much further gain can be made in a wind tunnel. There is a need for hardware, for a flying article."

affected by the general ideological climate in which the scientist works and which he reflects, whether by acquiescence or by frustration. If scientific work needs a consistently materialist outlook, then a climate of mysticism will inhibit it. Moreover, how fully, and for what purposes, the products of mental labour are used affects the incentives to, and productivity of, that labour. Since the products of scientific labour are commodities under capitalism, the disposal right over them belongs to the capitalist who employs the scientist's wage-labour. If alienation of the worker in general stems not only from the division of labour, but even more from the conversion of labour's product into a commodity, how much greater must be the alienation for the scientific worker whose product is not the standardised product of modern material production, but is required precisely because it has the uniqueness of the new.

We conclude that between the specialised activities within the laboratory, between laboratories, between R&D and education, and between R&D and production itself, there is a necessary unity. This requires, if increasingly extensive resources are not to be wasted, that the correct proportions between the specialised parts be maintained.

How far and how fast the division of labour—and on this basis the productivity of scientific labour—can grow depends upon whether the environment makes easy or difficult the unification of the specialised labours. Which environment, that of monopoly capitalism or that of socialism, can make it more easy, is a question which need no longer be argued solely on a theoretical basis. A decision between hypotheses becomes a decision between systems.

Unification of Labour and Production Relations

Consider first the primary relation between capital and labour.

Since R&D grows faster than production, the labour force in R&D forms an increasing share of the total labour force. This means that it is likely to be drawn from a slightly wider range of social strata. However, since it is the class position and not the class origin that is more decisive, it is important that the modern scientist and technologist typically sells his labour services to a large private or state employer. His labour is wage labour.

Secondly, with the concentration of research in large establishments and firms (ICI employs 11,200 in R&D) with collective teams replacing individual labour, with scientists experiencing redundancy (albeit probably temporary) as firms merge and close down laboratories, the experience, and thus the behaviour of the scientist begins to become more like that of longer established wage workers. I would emphasise "begins"; and would not exaggerate the

extent of the development, pointing only to its direction and speed.

Thirdly, as we have shown, a scientist is alienated from the product of his labour. Wiener, the father of cybernetics, noted: "In this environment (the USA), information will be evaluated according to the standard American criterion of evaluation: a thing is valuable as a commodity for what it will bring in the open market". The control of the scientific labourer over his product diminishes. It may be used (or deliberately not used) in order to buttress some privileged monopoly position, or it may be used militarily by the State to buttress a decaying social order.

Some twenty years ago Maurice Dobb wrote: "Man as a technician in the production process increasingly stands in opposition to labour power as a commodity". Today, under new conditions, one might restate this for scientific workers. "The scientist as a potential liberator of mankind stands in opposition to his status of wage slavery. As a potential liberator he inspires respect and affection. As a wage worker with little control over the nature or use of his product he can become a potential destroyer of mankind, and inspire fear and contempt."

This objectively existing alienation reflects itself in the minds of an increasing number of scientists. The reflection is intensified by the contrast with socialism. One does not need to whitewash ideological or bureaucratic weaknesses, nor to ignore the hangovers of historical backwardness, in order to maintain firmly that under socialism the producer of scientific knowledge has a quite other status. The product of collective scientific labour is a direct use value for society; hence the scientist can feel that he is working directly for society and for socially determined ends. The possibility of eliminating anarchy exists. True, there will be avoidable errors, and the laws will be imperfectly understood. But the unity of scientific labour meets no barriers of monopoly self-interest. So far, for historical reasons the superiority of the scientific product of a socialist society has become apparent mainly in one sphere, that of space research, though it has not escaped notice that this sphere embraces the most important areas of advance of modern technology. Twenty years ago the western scientist went to the USA as the mecca of scientific advance. He may still go, but takes the precaution of learning Russian!

Finally, with reservations, one can say that scientific ideas have permeated a larger part of the labour force. This is not to say that irrationality or reactionary sentiments have disappeared in social movements. Racialists remain. But at least they are no longer unthinking. They are either shamefaced or barefaced.

Second, consider production relations between the capitalists.

The concentration of R&D is much greater than that of production. In most US industry in the mid '50s, out of 15,500 firms which possessed research facilities, seven firms alone accounted for 26 per cent of total expenditure (E. S. Mason: *The Corporation in Modern Society*, 1959).

In Britain not only is the same trend observable, but it is deliberately encouraged by governments. Mr. Brown has recently spoken up for policies earlier justified by Mr. Heath (as Minister) in 1963: "It may be that the improvement of R&D in Britain will require changes in the structure of our industry and an increase in the size of firms. If this is so, it is a development we should not resist." In the science-based industries at least the minimum scale for efficient research is becoming a key factor in the growth of concentration.

Thirdly, there is a growth of state activity in R&D.

The large minimum size of research (and even more of development) projects has put them out of reach of all except the largest firms, and often even beyond theirs, especially where the risks are considerable and the rewards difficult to confine to the private gain of the initiator. Because research is more hazardous than production the monopolists wish social responsibility for losses, private appropriation of gains. Thus in Britain and the US about two-thirds of research is paid for by the state, but about two-thirds is carried out in the private sector. If there are losses to be borne they are borne by the state: the indirect gains to the maintenance of monopolistic positions which come from obtaining key research projects are enjoyed by the privileged recipients of state aid.

Contradiction between the Social Production and Private Appropriation of Knowledge

There is no dispute that growing specialisation requires growing co-ordination. But the growth of monopolies of size has been accompanied on the one side by the need and on the other by the power to monopolise the production of knowledge. Entry into modern R&D is very expensive.

But monopoly in this field does not abolish anarchy in the production of knowledge. On the contrary it strengthens it. Under the anarchy of competitive capitalism the co-ordination between research in different fields and by different workers could be affected—with a short time lag—by the sale and purchase of knowledge on the market. Under monopoly, the greater power to develop knowledge by planning within the larger and more powerful research department is matched by the correspondingly greater power to erect barriers to its transmission. With the mutual dependence between

research in different fields as an increasing function of the depth of penetration into the secrets of nature, the need for mobility of information grows: the capacity to provide that mobility, in a world of the growing concentration of research facilities, diminishes. Wiener argued that the treatment of scientific knowledge as a commodity in the open market "leads to the misunderstanding and mistreatment of information". The markets of monopoly capitalism are not "open" but closed.

With growing discontinuities, variation in gestation periods, and the interdependence between fields, the avoidance of waste demands long-range planning. The truth of this, within the single firm, is accepted. The growth of state intervention in this field is a reflection of need, especially in the face of planned use of scientific resources under socialism, to reduce anarchy. But the needs arising from the potentialities of the productive forces and the capacity of the capitalist state to accommodate them must not be confused. Certainly it would be wrong to suppose that no attempt is made to co-ordinate the activities of R&D, or to co-ordinate the output of the educational system with R&D's needs for high-level manpower. But it would be even more wrong to suppose that the drive for monopolistic privilege can be averted. Indeed the very plans which the state itself inaugurates, and the passports to a riskless Elysium which it distributes through its own research contracts become the prizes in a new political arena where each seeks to bribe, cajole, and infiltrate. The plan that emerges is not a plan of co-ordination dictated by the needs of the productive forces. True it is in part a necessary plan to meet the challenge of a rival social system. But it is above all a plan for the distribution of privileged positions dictated by the balance of forces between irreconcilable monopolists.

III. CHANGES IN THE WIDER PRODUCTIVE FORCES INITIATED BY THE SCIENTIFIC-TECHNICAL REVOLUTION

So far we have examined that part of the productive forces which is setting the pace for the remainder. Let us now consider the remainder.

Four breakthroughs, not separate but interdependent, embody the fruits of the scientific-technical revolution—first, new sources of energy; second, a new and seemingly endless vista of man-made, almost tailor-made, materials; third, advances in chemistry and genetics which are revolutionising agricultural productivity. Fourth—and perhaps most spectacular—electronics offers quite new possibilities for observation, analysis and control of processes which involve rapid change. Observations, converted into electronic impulses, analysed at speeds impossible for the human operator, make possible almost instantaneous feed-back of response and

adjustment. Minute responses can be amplified without limit to enable control with great accuracy of enormously powerful mechanisms and processes.

The most general effects of these advances upon the material productive forces³ is to promote further the already highly social nature of production through further subdivision of social labour. Within some single processes the subdivision of labour certainly diminishes, but it does so alongside the growth in the division of social labour taken as a whole (and increasingly on a *world scale*).

In each newly created subdivision there is increased inflexibility in the quantity and quality of output. For example, the application of electronic devices to a sequence of information, analysis, response, increases the speed, and in many cases the accuracy, of control: but it does so at the expense of decreasing the variety of operations to which the sequence can be adapted—an effect which is not new in principle, but is new in degree.

Secondly, in each new subdivision there is a rise in the ratio of means of production (especially instruments of production) to labour. In the 1930s, for example, a power station generating set had a typical capacity of 30-60 mW, and one of a 100 mW was a giant. Now the standard is 500-660 mW, and engineers plan for 900 mW. An Esso advert. speaks of its refineries producing four million gallons per day as being controlled from one room by a shift of only seven men. To describe this change rather as a growth in the ratio of “dead” to “living” labour is not just a piece of dogmatism or perverse pedantry. For “dead” conveys very well the rigidity of the technique once materialised in fixed capital, while “living” stresses the adaptability of *human* labour.

Thus an increase in the ratio of dead to living labour increases the inflexibility of processes. Further, more powerful equipments, capable of dealing with greater temperatures, pressures, vibration, corrosiveness, must usually be more durable and therefore *long lived*: yet the very speed of technical progress makes it desirable that they should wear out as soon as they are obsolete, and therefore be *short-lived*.

Thirdly, the minimum, or “threshold”, size of viable plant in particular processes is growing, but it does not grow at the same rate. This uneven development disrupts the established proportions between processes.

Fourth, except when its introduction is retarded by the existence of very cheap labour, the application

of the scientific-technical revolution to industry tends to displace routine labour and replace it by skilled labour. The new skill required is not the widely-based skill of the time-served engineer: it is rather a deeper skill, based on scientific training, but covering a narrower range of operations. Labour is becoming less flexible and more specialised. Again, this is not new. What is new is that the average period of training seems to be lengthened rather than shortened. This raises problems of the appropriate structure of skilled manpower and of the careful co-ordination of its production through time.

Fifthly, the very changes in material production itself, by changing the nature of the labour process and the structure of the labour force, change the mode of living and needs of the population while at the same time offering the possibility of a whole new range of products. Demand grows, but it grows unevenly as between different products. This affects unevenly the fate of different industries and therefore of specialised regions. If regions are unable to, or are prevented from, adapting their assortment of output to the new demands, the real rewards to their labour fall. Hence the existing relations of distribution, especially on an international scale, are subject to large and rapid changes.

The Unity of the Production Process

These increases in the division of labour, alongside the other changes in the production process associated with them, raise new problems for the integration of the activities of the subdivisions.

First, the output from plants becomes rigid as to quantity and quality. Products are standardised. But the plants which produce them are extremely expensive and quickly obsolescent. Often for technical reasons, but always for economic reasons, the failure to use them continuously to full capacity causes a sharp rise in costs per unit of output, and a sharp fall in profits. Hence output is also quantitatively rigid.

Secondly, qualitative and quantitative rigidities of output require the establishment of strictly defined proportions between technically co-ordinated processes.

Thirdly, the long gestation period of plants (in respect both of the R&D work involved in their design and the length of their construction period) and their relative durability raises the problem of the unity of and balance between processes not only at each moment of time, but also *over longer periods of time*. The planned provision of inputs to, and the allocation of outputs from, different and linked enterprises which will come into existence only five to ten years from now, is a problem which exists in capitalist and socialist economies alike. In socialist economies it can in principle be solved since the plants have a common owner. Under capitalist con-

³ In a passage which did not receive the attention it deserved from Marxists or economists generally, Dobb analysed the changes in the productive forces in the inter-war period already in 1946. v. *Studies in the Development of Capitalism*, pp. 358-70. The debt to this passage in what follows will be obvious.

ditions the problem appears as an ever more acute one of guaranteeing secure future supplies of materials and future markets—not merely as a technical problem, but as one whose solution must be consistent with the maintenance of maximum monopoly profits.

Fourthly, the proportions which require regulation are not only those within material production itself, but also those between material production, R&D, and education.

Fifthly, the result of these developments is a rapid growth in the productivity of labour. The balance or proportionality between the rate of expansion of output and the rate of expansion of consumption, is, unless the two levels are co-ordinated, subject to an increased contradiction.

Conditions for the Unity of the Divided Labours

The changes initiated by or rather qualitatively accelerated by, the scientific-technical revolution are thus an alteration in the division of labour in ways which make the required proportions between processes more rigid over longer periods. The process of correction of disequilibria or disproportions by small marginal adjustments becomes impossible. Only prior planned allocation, over considerable periods of time, of large blocks of social labour (both “living” and “dead”), can prevent the growth of disproportions.

In short the greater contradiction between the subdivision and unity of the process can be solved only by an increase in the planned allocation of resources. Planned allocation requires that the resources be subject to unified control. The dead

labour, which is the more intractable problem, is in all societies the property of someone. Where it is under a single ownership, as in a planned socialist economy, the integration presents only an intellectual, technical, organisational, problem, albeit a formidable one. Under capitalism the unification of control can come also only from a unification of ownership. That means a growth in the concentration of capital. This has developed and is developing spontaneously at a rapid rate. But the spontaneous process is not enough. As a West German writer in the conservative *Die Welt* put it in November 1966: “We are faced with the giant integrated plants of the East; we are faced with giant monopolies of the United States, which penetrate our economy. Our state must intervene to force the pace of national integration.”

Over the turbulent new productive forces offered by science, that can transform the lives of the people for good or evil, the working people who possess no property have little control. At the same time, to accommodate these new productive forces at all, the monopoly capitalist state must move out from the wings to the centre of the stage, no longer a hidden figure appearing only at moments of crisis, but a permanent actor, its economic actions in the political limelight. Even were there no socialist world, no socialist productive forces, this would be true. *But there are.* Under capitalism and socialism alike, the speed at which the productive forces grow, and the purposes for which they are used are matters of state control, of politics. As the contrast between growth and aims of growth under the two systems becomes plainer, so does the need for state power in the hands of the working people.

The Application of Mathematics to Problems of Political Economy

John Eaton

IN a sense one might say that economics is man's "missing science"—as human powers of control over natural forces surge forward, the ability of men to transform power over nature into advancement of human society has yet to be established. New potentialities of technology are demonstrated daily and still millions in this world of ours starve. But worse, it remains still possible that we shall use our very power over natural resources to annihilate our human communities. In short, we remain poor in social wisdom and at the root of our dilemma lies the economic problem—the problem of providing not only the means of existence but also the means of activity, the human and social activity without which human life is meaningless. In this sense, economics, the science that studies the social use of resources, seems to me to be "the missing science".

The Missing Science

The cost to human progress of our deficiencies in this field are so heavy that there can be no higher calling than that of trying to fill this gap. But how should one answer if someone of intelligence, courage and integrity declared his readiness to dedicate his life to this missing science and asked "How shall I set about it, where shall I begin?" First I think I would draw his attention to what Marx said in his Preface to the *Introduction to the Critique of Political Economy* (1859); "My views, however they may be judged, and however little they may coincide with the interested prejudices of the ruling classes, are the result of conscientious investigation lasting many years. But at the entrance to science, as at the entrance to hell, the demand must be posted:

'Qui si convien lasciare ogni sospetto,
Ogni viltà convien che qui sia morta.'
(Here leave behind all timid hesitation
And here let petty baseness die.)"

Next I would urge him to read and study what Maurice Dobb has written.

Dobb's Approaches

The outstanding characteristics of Maurice Dobb's work are, for me, as follows:

(a) He begins and ends from a desire to serve

humanity, the ordinary people of the world, the "haves-nots" rather than the "haves". (To this his excellent popularisations are also a testimony.)

(b) He has a subtle and precise intellect that pays careful regard to truth and has not allowed this to be overborne by the pressures of an academic establishment (nor, indeed, by the pressures of the dogmatic Marxism that in the not-so-distant past stunted and distorted the growth of most Marxist theory).

(c) He comes to grips with the leading and most representative contemporary theories, drawing from them what has intellectual life and validity and criticising them on the basis of careful and accurate intellectual analysis (like Gramsci, whose maxim was that in theory—unlike warfare—one must attack one's opponents at their strongest points).

Maurice Dobb is, of course, a Marxist and, like him; I believe that the work of Marx is an indispensable foundation for understanding and changing human society. Study of the work of others is, however, only a preparation for attacking the living problems of today and the emerging problems of the future. The last thing, I am sure, that Maurice Dobb would want is for others to retrace ground he has covered. One may well imitate guide lines (such as (a), (b) and (c) above) to shape a style of work, but the point is for a would-be disciple in the "missing science" to look for what is new in the world of actuality and what needs to be new in the field of theory—if theory is to serve as a compass to man's social life.

Second Technological Revolution

He might well turn, for example, to Maurice Dobb's excellent *Studies in the Development of Capitalism* and, having looked at the chapter on the Industrial Revolution, ask what will be the impact of our own technological revolution on our economic and social situation. Marx's study and analysis of the impact of technological change on the economic and, beyond the economic, the social and political relationships of men in society, was one of his most profound contributions. On the basis of his theory the working-class movement was able to see the

historical role it could play and was able to unify its moral, cultural and economic strivings for progress round the aim of building a socialist world, uniting like-minded workers from all countries of the world and initiating a movement bringing hope and common purpose to all peoples weighed down by poverty, oppression and the destruction of war. The original impetus of scientific socialism will be renewed only in so far as it is possible to get the measure of the technological revolution that is now taking place and to express in the forms of theory its effect on the "laws of motion" of contemporary society. It is in this connection that mathematics is likely to assume exceptionally great importance for political economy.

In discussing this question one cannot avoid guessing at theoretical conclusions that need to be examined more carefully before being accepted. In particular, what is the nature of the contemporary technological revolution? Clearly such a fundamental question calls for the fullest theoretical consideration—much more than it is in fact receiving—since a basic change in the technologies of production must affect both the relationship of workers to their employers and other social classes and also the path of advance towards a socialist society. Inescapably the technological revolution will turn social life upside-down—the point is to control these changes and within the possible courses of development to permit human beings to shape their conscious choices.

This is the essential freedom that people throughout the world are today feeling it their right to claim. But such freedoms can be got only by the action of organisations that develop and give leadership and consciousness of themselves to social forces. In Britain the organisations of the working class will run into great dangers and difficulties if they do not study and understand far more deeply the nature and significance of this technological revolution and put themselves in a position to look more to the future and less to the past. The point is for trade unionists and socialists to establish themselves as ideological leaders and architects of new, practical policies at a time when technological change is invading every aspect of life for the British people and when we are becoming more and more aware that, as a nation, we are drifting aimlessly and without social purpose. A conscious grasping—and that means a theoretically well-founded understanding—of the impact of technological change on social change, would enable the organisations of the working class to integrate present demands within longer term policies of social change. Without this there is no chance of the mass of ordinary people finding freedom as individuals to shape the patterns of their lives nor of creating a

rational, peaceful, and modern community capable of using the potentialities of modern science to the benefit of man.

The study of these theoretical questions is, therefore, of the greatest importance to the labour movement and views such as those suggested in this article should be regarded as no more than a tentative basis for further argument.

Importance of the Computer

The special importance of mathematics in relation to the political economy of the future is linked with the key importance of the computer in the technological revolution. Marx's view of the first industrial revolution is well summarised by Maurice Dobb in his *Studies in the Development of Capitalism* (page 258):

"The essence of the transformation was that change in the character of production which is usually associated with the harnessing of machines to non-human and non-animal power. Marx asserted that the crucial change was in fact the fitting of a tool, formerly welded by a human hand, into a mechanism; from that moment 'a machine takes the place of a mere implement', irrespective of 'whether the motive power is derived from man or from some other machine'. The important thing is that 'a mechanism, after being set in motion performs with its tools the same operations that were formerly done by the workman with similar tools'. At the same time he points out that 'the individual machine retains a dwarfish character so long as it is worked by the power of man alone', and that 'no system of machinery could be properly developed before the steam-engine took the place of the earlier motive power'. At any rate, this crucial change, whether we locate it in the shifting of a tool from the hand to a mechanism or in the harnessing of the implement to a new source of power, radically transformed the production process. It not only required that workers should be concentrated in a single place of work: a factory (this had sometimes occurred in the previous period of what Marx had called 'manufacture'), but imposed on the production process a collective character, as the activity of a half-mechanical, half-human team."

The essential point of our own, the second technological revolution is that *routine processes of the human brain* as supervisor and co-ordinator of the production process can now be entrusted to the non-human, non-living apparatus which is today given the generic description of "Computer". One need not here argue whether the physical heart of the technological revolution should be sought generally in the electronics industry with all the means it provides for imitating the human senses or, more specifically, in the digital computer. At this moment of time, the digital computer holds the centre of the stage by virtue of its ability to perform

with perfect accuracy at speeds of light any logical routine (often of the greatest complexity) provided only it is specified with complete precision. This supplanting of routine "brainwork" is the analogue of the tool supplanting routine "hand-work" in the first industrial revolution and is similarly supported by striking developments in the provision of energy (nuclear power in particular) and far-reaching scientific advances (of which the laser is an outstanding example).

Even if one were to consider the brain only as a technical instrument, one would declare it far superior to the computer by virtue of its versatility, its ability to tackle problems and to act on imprecise and faulty instructions, its imaginative powers, its immediate and easy acceptance and analysis of data from the surrounding world (seeing, hearing, etc.) and many other faculties that the computer cannot match. However, over a narrow range the performance and potentialities of the computer are astounding. As already said, it can, given precise instructions, perform highly complicated logical or arithmetical calculations with complete accuracy at, literally, the speed of light. Also, once instructed, it "learns" immediately, performs with almost 100 per cent accuracy and can repeat its performance whenever thereafter required. It has perfect memory (impeded only by the rare event of a technical hitch) and the prospect for the near future is of rapid access memories of almost limitless size. (Already a particular piece of information can be found out of 10^8 or more items in a matter of milliseconds.)

Computer Power

An artificial extension of brainpower in these particular areas, narrowly limited though they be, is of tremendous social and economic significance. A worker in a factory co-ordinates the operation of machines, etc., so as to make their various activities part of the co-ordinated activity of the plant as a whole. He uses information from the management (instructions) and from the machines (control of production) so as to achieve the aims of the plant as a productive system. The drudgery of mass production results precisely from the fact that the worker as an information processor is "a cog in a large machine" repeating again and again a routine process of control—that is, precisely such routine processes that the computer is well-adapted to undertake.

It should be noted also that the cost of computers, high as it is at present, can well, given sound economic policy, be brought down very considerably. The cost of a computer is not the running cost but the building cost and the heaviest item in the building cost is not the amount of work

and material that goes into the assembly but the thought, planning and experimentation that goes into the invention or design of the original models. Integrated circuits and microminiaturisation make possible the provision of computer hardware on a very big scale at low costs both in terms of material and manpower used in the assembly and production of components. Similarly, the cost of the software—the programmes that control the working of the computer and which the computer uses in processing data—is the original cost of thinking out what they are to do and writing them. Once written and tested, they can be reproduced for a few pence.

The possibility exists therefore of providing computer power on an extensive scale. Indeed, the exploitation of this possibility itself calls for socialist policies since the ordinary profit-seeking economics of capitalism make nonsense when applied to the world of computers and "fetter" the proper development and use of computers in the economy. There is, therefore, a very strong case for publicly managed computer "utility" (on the same lines as water or the telephone) and this is something for which the labour movement should press strongly and urgently and seek to control in such a way as to ensure its use to advance the social purposes of a people's democracy.

Technology and Democracy

The technological revolution goes hand in hand, of course, with the most advanced and complex scientific and mathematical skills, but it is totally wrong to think that it is a "mystery" which concerns or can be understood only by the learned few and the "initiated". It is true that it could perhaps follow dangerous and disastrous courses if the mass of ordinary people lost all means and practice of creative social and political activity and became subjected to a narrow oligarchy supported by a scientific priest-craft (as in some nightmarish fantasy of an H. G. Wells or Dr. Who). This, however, could only happen as a result of the complete degeneration of our working class and popular organisations. The real situation is that the technological revolution will best develop if there is more and more participation by the ordinary people who live in the communities and work in the factories and so are best able, from their daily experience, to assess the social impact of technological change. The new technologies themselves call for multi-discipline teams involving varieties of skills and experiences. This is precisely what is required for economic and social planning in all forms and at all levels. It is essential both to the good use of technological possibilities and to the enrichment of life and social activity that new forms should be found for more and more participation by people in general—not just elected representatives, "captains

of industry", experts, etc., but everyone—in economic and social decision making. This is an area to which the trade unions, co-operative organisations, trades and labour councils, etc., might well direct attention. For a community to be socialist and democratic implies control of its activities by people themselves, not by rulers or technocrats or "leaders of the people". How this is to be done calls for some hard thinking by socialist and progressive theoreticians and bold experimentation by organisations of people at work, in local authority or social service activities and so forth.

At the same time, technical change provides remarkable new potentialities by the exploitation of which detailed information and other facilities to aid planning and decision making could be made widely and generally available (e.g., readily accessible "data banks" and programmes for analysis of data).

Constructing Models

It is because we are moving into this world of computers that it becomes important to develop economic theory in an appropriately mathematical form. We need to study the concepts of mathematics and to stimulate the creation of new concepts to serve the needs of economic science. The particular importance of mathematics to economics is that it facilitates the building of economic models. The particular significance of the "computer revolution" is that the computer is an excellent means of "bringing mathematical models to life" and seeing how they work in practice. So we have today the opportunity of constructing models that simulate the essential framework of social and economic situations in which we find ourselves or are considering putting ourselves. Armed with these facilities we can draw data from the real world or construct hypothetical data, varying from the real data as we may wish, to test various hypotheses. In the past this facility of "making the model work" was largely denied us because the time and toil required to manipulate the input data vastly exceeded the bounds of practical possibility. The computer changes all this and makes it possible to simulate our social surroundings. This gives us, as individuals and as a community, a clearer and fuller consciousness of the conditions of social life. The modelling of our immediate surroundings in our own brains which enables us to live as individuals can now be repeated on a social scale, making possible a great enrichment of man's social life.

Interesting in this context is J. Z. Young's *A Model of the Brain* where he writes: "Every organism, in order to survive, takes actions that are appropriate to the surrounding conditions. It does this because it contains in its nuclei a controlling system that adequately represents the environment." (Page

286.) He then, in passing, points to the social analogy as follows (page 297/8):

"Indeed, the characteristic of man is that by means of language and tools he constructs models of the world outside his own brains and outside his own genetic system. By proper use of these models, he should be able to overcome all the risks that the environment offers. But there are evidently risks within the language system and social-economic systems themselves. The proper use of these means of communication depends upon a degree of co-operation that is not always readily elicited, especially between larger groups of people. Perhaps inquiry into the fundamental nature of the information-gathering circuits and the types of models they produce may help towards ensuring the stability of human life."

His book ends with these words (page 323):

"Equally exciting is the discovery that one can play a part in the process of model-building itself, producing artefacts that are both interesting and useful. Models themselves have great beauty. It is true that theirs is only a dim representation of the glories of the world around. But without them how else are we to know these beauties. . . ?"

Mathematics and Models

Mathematics may be defined as "The science or art of model building" (though most mathematicians are reluctant to commit themselves to saying what their science does). As such mathematics is an essential part of the social activity of model building, which in turn is an essential part of economic science within the technological revolution as it gathers momentum.

Up to the present time mathematics has been applied mainly to the physical aspects of the world, where, however, the fruits of its applications have been gigantic. It is no exaggeration to say that the technology of the machine age had its mathematical foundations in the model of Newtonian physics. But the application of mathematics is now spreading out beyond physics to all the sciences. Possibly the most remarkable developments have been in the biological sciences in which the new logic of cybernetics (which is closely akin to the "logic" of dialectical materialism) has emerged and from which most valuable lessons for the application of mathematics to the social sciences are to be learned.

In some senses, the concept of model-building in the social sciences is not new. The excitement of Quesnay's *Tableau Economique* and the richer, fuller model in Marx's *Capital*, Volume 2 (which germinated from Quesnay's idea) springs, I think, from the feeling that we here have an instrument with which to represent and eventually control the economic scheme of things. Indeed, the whole of *Capital* is a model of the economic aspects of

capitalist society and "the law of motion" that Marx was studying is much the same as the laws of operation that are studied by cybernetic models today.

Paving the Way

It is a remarkable fact that the work of mathematicians through the last century, as it were intuitively, anticipated the computer and paved the way for it. The essential idea of the modern computer was conceived by Charles Babbage in the early part of the 19th century. However, his efforts to build it by mechanical means were in vain. Its technical feasibility required valves or better still, the transistor, and the electronics industry as a whole. (But in his search for mechanical means he made a thorough survey of production techniques on which Marx drew extensively in his analysis of the capitalist productive system.) The apparently abstract and remote researches of Boole, Cayley, Frege and others out of which modern abstract algebra, set theory and an understanding of the logical foundations of mathematics emerged, paved the way to computer science and cybernetics. Russell and Whitehead painstakingly demonstrated the elementary logical processes on which the complexities of mathematical calculation were founded. The philosophical meaning of these findings remains debatable; however, work by Turing along somewhat similar lines was soon to be given a practical twist and show how, in fact, a machine which could physically simulate the elementary processes of logic went far beyond the adding and subtracting that the mechanical "calculating machines" were already able to perform. The main snag—and this was Babbage's stumbling block too—was that the chain of logical operations equivalent to the more sophisticated manipulations of the mathematician, was very long and tedious. Work such as that of Turing on the abstract theory of the machine and others who probed the ultimate logical elements out of which mathematical processes are constructed, would have been of little practical significance had not the electronic computer been produced; for the electronic computer is able most excellently to run through incredibly long chains of logical routines in an incredibly short time.

So mathematics is brought down from the mountain tops into the market place. As recently as 1920 the great English mathematician G. H. Hardy could say "The study of mathematics is, if an unprofitable, a perfectly harmless and innocent occupation". Today it is appearing everywhere in the most practical and "useful" applications—in traffic control, stocking policy, queuing theory, etc., etc.

Down from the Ivory Tower

It is essentially the computer that has dragged

the mathematician down from his ivory tower. The beauty of physics was that a relatively simple deterministic model (for example, the ellipses depicting the movements of the planets) corresponded rather closely to the reality. The abstractions of the model left you still recognisably close to the actual world we know. One found invariants in the real world very like invariants of the model, enabling one, for example, to calculate with some precision by use of the theoretical model such things as the timing of eclipses, periods of high tide, etc., etc. By comparison the complexities and irregularities of the biological and social fields even when mathematical concepts could be framed to represent them tolerably well, could rarely be calculated mathematically at acceptable costs or within a reasonable time. Such concepts, therefore, had practical significance only indirectly insofar as they helped to clarify ideas and not as models that gave practical answers on specific questions of fact. All that is now changed by the computer which, once the procedure of manipulations (the "algorithm") has been defined with precision, can perform the needed calculations handling massive data in short periods of time at low cost.

Undoubtedly this will lead to new kinds of mathematics appropriate to the representation of these new fields. At the same time, it will put economists on their mettle. The endless sermonising and apologetics that have characterised much economic theory in the past will be put on the spot. The test of good theory in economics will become more and more (as in physics already long ago) ability to provide good foundations for practically useful models, i.e., models that can be constructed and correspond to real life situations and possibilities. Economics in this way may become more and more an experimental science in which models simulating actual situations can be used to test the feasibility and consequences of suggested policies.

Economics and Models

Economic theory will need to develop much stronger foundations than it has at present if advantage is to be taken of these new potentialities. The inadequacies of marginalist theory have already become apparent; but there are also theoretical weaknesses in Marxist theory that need to be overcome. For example, it is difficult to construct a model for planning purposes and one cannot effectively measure such important concepts as productivity without some measure with which to unify the economic quantities appearing as input and output in the economic process, without, that is, some well-worked-out theory of price and value. This is, at present, still lacking. However, it is already clear that, amongst other things, the arrival

of the mathematician and the computer on the scene is stimulating a more and more scientific examination of the problems of economic theory in the socialist countries.

However, it is not only in the socialist countries that mathematics is having an impact on political economy. No country in the world today, and least of all the industrially advanced countries, can attempt to run their economies without some means of economic planning. (For an excellent examination of this question see *Democrazia di Piano—Democracy in Planning*—by Silvio Leonardi, Einaudi, Italy, 1966.) That this planning is often lunatically ill-conceived (for example, the Labour government's incomes policy) mirrors the contradictions that exist between, on the one hand the fact that no government can escape some attempt to plan and on the other hand the fact that effective planning calls for a break with prevailing interests and forms of thought and political organisation. Planning essentially means controlling "a system". To do this implies that a model must be constructed simulating the logical and economic interdependencies of various parts of the system; then with the aid of this model regulators must be devised to control and guide the development of the system.

At once the question arises to what end is the system to be guided? And who is to guide it? Who is to take the decisions? If democracy means anything or is to come to mean anything real, people must be able to participate in the decision making when plans affect their way of living. This implies actual constructive co-operation by a wide range of people at every level. Only so can the social and economic system be steered and controlled by the people themselves in the way that they want it to go—which is precisely the point of planning. But in fact the apparatus for all this (technically and as regards political and social organisation) does not exist or only embryonically exists. So one gets bureaucratic planning in which lipservice is paid to the social objectives of planning whilst, in fact, status quo thinking and vested interests do the decision making. It is to this problem of control and participation in decision making via planning that the labour and trade union movement needs to direct its attention. This needs to be done at all levels—production planning in individual factories, local plans for schools, roads, health services, etc., regional plans, etc., all the way up to national plans and policies. Only by participation in the actual deliberations through which practical plans are formulated can democracy, i.e., people being in control of their own destinies, acquire life and reality. Without this the election of political representatives means little and the real power of decision lies in the hands of owners or controllers of property,

together with the senior administrators and experts in the apparatus of public authority.

Political Importance of Mathematics

From this one must deduce that the political importance of what the mathematician does is very great. The theory of computers and of mathematical models in the social and economic field is a matter with which trade unions and other organisations of the people need to concern themselves every bit as much as with the intricacies of law or wage negotiation. Of course, trade unionists do not need to be expert mathematical economists any more than they need to be lawyers; but they need to understand how mathematics and computers can be used in relation to social planning in order that these instruments of planning may be used in the way they wish and also, more importantly, in order that they may serve as a focus of activity from which to develop democratic as opposed to bureaucratic planning in Britain.

Mathematics enters into all this through three doors. First, there is the art of handling figures (statistics) with which trade union organisations already have some familiarity. Secondly, there is the mathematics of computer science in a world in which the impact of the computer is becoming more and more striking. (Some—in my view rightly—speak of the present technological revolution as the "information revolution".) Thirdly, there is mathematics as the science of model building to simulate the social and economic environment with respect to which political decisions need to be taken. In fact these three aspects merge in that what is wanted and what computers can give is (a) selection of particular facts from massive data (b) answers to specific questions about the pros and cons of particular courses of action and (c) models simulating the social and economic environment which the planning decisions are designed to regulate.

It is along some such route as this that the democratisation of economic and social decision making becomes a possibility. A classless society, if it means anything at all, must imply that people decide for themselves and do not leave the management of political affairs to a "ruling class" placed above them. The actual means by which participation in decision making becomes possible need to be explored and debated, but it is fairly evident that tools need to be fashioned with the aid of economic and mathematical theory, which will enable people to see clearly what questions are at issue and to obtain full and relevant information on these questions. Such a "democratisation" of information and information analysis is becoming possible thanks to the computer and other emerging electronic techniques coupled with new developments in mathemati-

cal thinking applied to economic and social problems.

In the ordinary course of education more and more children will be learning about computers and the new mathematics. But the real question at issue is whether these students are destined to become servants, perhaps well-paid servants, of a bureaucratic system of planning which only grudgingly acknowledges the rights to work, health and education that men and women today are claiming or whether decisions about how social resources are used and how social life is to develop, are to be made actively and creatively by people themselves for themselves.

The second alternative is not a possibility unless socialists and democrats hammer out for themselves an alternative philosophy and this must mean working out how to live with and make use of the new technology. In this sense, the impact of mathematics on economic thinking which capitalist managers in Europe and USA and socialist administrators in the USSR and Eastern Europe are keenly interested in already, is also a topic of high importance to socialists and democrats in every form of popular organisation in Britain. In making this point I have particularly trade unions in mind since the economic decisions to which mathematical techniques specially relate have a direct impact on their working lives. However, it is, in fact, essential to arouse interest in such matters as widely as possible since community decisions to be effective need to take into account the views and reactions of all social groupings.

Democratic Planning

Exploration of the techniques of mathematical model building, of data banks and so forth will, I believe, show how large, complex, highly developed communities will be able to be effectively self-governing. But the technical-mathematical aspects are only one side of the question. The other is the involvement of big numbers of people in teams charged with recommending practical solutions to specific social or economic problems. Here there is something to be learned from the methods of operational research which originated during the war when scientists such as Bernal and Blackett

worked with teams of people from different disciplines to tackle problems that the conduct of the war against fascism threw up. Groups of people with varied experiences and backgrounds with the support of specialist advisers should be able to work out solutions to social problems far more effectively and imaginatively than the traditional administrative machine. The techniques of operational research can, of course, be applied to any social or economic problems, but whilst one wants to bring in where useful the expertise of scientists, mathematicians, etc., many such problems require essentially the co-operation of non-specialists with practical or "shopfloor" experience. More and more needs to be done to link the work of the technical specialist to the wider activities of ordinary life.

In such ways the new technological possibilities, so far from removing understanding from the ordinary man and woman, so far from making control of things more esoteric and mysterious, can help to bring into being truly creative and vigorous forms of democracy. The political economy and the sociology of the technological revolution must become the topic of wide popular debate and political action in the organisations through which popular will finds expression. All these matters need to be looked at and studied in a scientific way from the standpoint of developing democracy.

Here again theoreticians of the labour movement have much to learn from what Maurice Dobb has done. One of the exceptional merits of his work as an economic writer and teacher has been his ability to express economic ideas with scientific precision, without vulgarisation or "writing down", to meet the needs of working-class readers and students who have not time for lengthy specialised study. It is this quality of simplicity combined with scientific soundness that wins Maurice Dobb's booklets on economics such a wide readership. We shall need many more scientists, mathematicians and economists who, like Maurice Dobb, know how to pass on their understanding to non-specialists. With the aid of such men and women able to infuse the technological revolution with the wisdom of the people, democratic planning could become a reality in Britain and prove itself practical, effective and invigorating to those whose lives and activities it embraces.

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