Science, technology and socialism ....
— Romaine Rutnam

In 1978 the relationship between technological change and employment under capitalism became the centre of a major industrial dispute when technicians working for Telecom Australia took industrial action to try to stop the installation of a new telephone exchange system. The issues raised during that dispute included: the elimination of jobs; the deskilling of the majority of jobs that remain; the increase in managerial control in the workplace; and the import of foreign technology and the neglect of research and development of Australian technologies.

One of the consequences of the public interest raised by this dispute was the establishment in 1979 of a Committee of Inquiry into Technological Change in Australia. Perhaps predictably, the committee (on which the federal secretary of the Telecommunications Employees’ Association was “balanced” by the Vice-Chancellor of a major university for science and technology, and the manager of a local affiliate of a Swiss-based aluminium company) produced a report in 1980 which glossed over the concerns publicised by the Telecom technicians, and settled on a position that the process of technological change was inevitable and, in the long run, would be beneficial to all.

One of the most serious defects of this report was its failure to point out the growing dependence of all sectors of Australian industry — agriculture, mining, manufacturing, tertiary sector — on decisions with regard to the development and/or introduction of technology being made by multinational corporations. Expenditure on research and development in the private sector declined considerably during the 1970s. While the government sector continues to fund a very high proportion of research and development, much of this is devoted to basic scientific research related to the agricultural...

(Based on a paper delivered at an international round table conference in Cavtat, Yugoslavia, in 1981.)
industry. Another view of the government’s lack of enthusiasm for sponsoring Australian science and technology development can be gained from comparing the approximately $115 million it allocated for such programs in 1979-80, with the $507.6 million effective cost of its investment allowance in that year.

The highly optimistic, and technologically determinist view of the government is now being increasingly opposed by the trade unions on the basis of growing numbers of studies being undertaken of the concrete effects of technical changes in workplaces and communities within advanced capitalist countries. The widespread introduction of computers into the labour process in most industries has quite clearly been the major technical change of the 1970s. Its effects on employment in Australia have been significant.

**Employment Implications of Technical Change in Australia in the 1970s and 1980s**

The shift towards tertiary-trained occupations

The most noticeable trend to be observed in the changes in occupational structure recorded in the last three Population Censuses has been the increase in "white-collar" occupations, and the corresponding decline in "blue-collar" ones. Large gains have been made in the professional white-collar category which includes teachers and engineers with university degrees, and in the para-professional (technician), clerical and sales occupations, while substantial losses were experienced in the relatively unskilled labouring jobs.

These changes are best described as the result of the transition from experience-based to science-based technologies. Organisationally, this has meant a shift within primary and manufacturing industries from production work to maintenance and central services work (the latter including research and development, engineering, financial planning and training functions), as the actual tasks of production have been mechanised and/or automated.

In the tertiary sector — both public and private — most of the workforce can be categorised as "white-collar", but even within this broad category there appears to have been a shift to a slightly greater proportional increase in the senior managerial and professional positions. This has mainly resulted from the growing establishment of separate electronic data processing departments, and the setting-up of elaborate work studies. Time and motion study, organisation and methods and management training groups within individual companies and government departments. There has been a corresponding decline in the routine clerical functions, as these have been computerised.

While the 1970s saw a sharp pruning of the labouring jobs in the rural, mining and manufacturing industries, the 1980s are expected to see a massive decline in clerical and sales operations in the finance, commercial and public administration sectors as a consequence of the massive investment in computer and communications technologies in the late 1970s.
The question of skill

The elimination of unskilled labouring jobs and the shift towards tertiary-trained occupations has been the basis of the much-vaunted claim by employers that computerisation has led to the need for increasing skills in the workforce. This claim should only be substantiated by a close examination of the concrete tasks people perform in their work, and not by resorting to statistical analysis based on broad occupational classifications — on which most of the employers' arguments have rested.

There can be no doubt that the mechanisation and automation of production processes have led to a reduction or a complete elimination of the human skills involved in such production. The continuous casting process in the steel industry, for instance, has eliminated almost a dozen different operations: ingot casting, ingot reheating, blooming, slabbing, and connected materials handling and transport operations. The skills that the operating staff had to learn, often through years of experience, based on their direct observations of changes in, e.g. the colour, sound and heat of materials, are now transferred to machines which can sense, test and monitor such changes. Human judgments are increasingly based on the reading of instrument indications, interpreting their meaning and their inter-relations, and drawing conclusions from them. "The sources of data for decisions have been moved from furnace, converter and rolling train to instrument panels and control pulpits."

Mechanisation and automation thus require the workforce to reach some level of literacy and numeracy to understand the meaning of instrumentation and respond correctly to its signals. However, automation has also tended to simplify and trivialise many of the human decisions that remain to be made within the labour process. Operations work often just means sitting around and waiting for a light or buzzer to warn of a malfunction. Clerical workers merely have to respond in a routine way to standardised procedures and instructions.

While at this stage it may appear that the need for greater numbers of technicians, engineers, researchers, financial and computer systems analysts, etc means that higher levels of skills are exercised, much of their actual work has already been formalised and standardised through computerisation. In the near future, the process will be greatly intensified when the use of computer numerically controlled lathes and computer-aided design systems becomes more widespread, and when the more reliable new-generation machines with micro-processor controls of fewer moving parts are introduced here. As the Telecom technicians noted, there is great potential for maintenance work to be deskillled to the level of removing a defective module and slotting in a new one. Engineering design and draughting work is also rapidly being automated. Effective computer control is seen as a substitute for a lengthy training and skilled manpower.

There are some exceptions to this process of human deskillling and that is at the higher levels of management. Here, decisions are now made on the basis of much greater volumes of information than ever before, made possible by the computerisation of the results of each section or branch or department of the labour process. This has led to an increase in management training in techniques of work measurement, and planning, programming and budgeting based on — often — daily reports of output, performance, achievements of targets, etc.

It is common to find that while most areas of industry are working shorter hours through a drastic reduction in overtime or the achievement of a 35-hour week, senior management staff are working longer hours than ever to keep up with the floods of information with which they are inundated. While some exceptions to the rule can be found, the way automation has been implemented so far in Australia has led to a much greater centralisation of information, decision-making and, consequently, power and control within the workplace.
The intensity of work pace

Computerisation has led to a speeding-up of most work processes in the 1970s, and especially in the "information sector" previously considered immune to "speed-up". Not only has the work pace been increased through a more accurate control of manufacturing processes, but the tolerance of timing between one process and the next has been dramatically shortened, so that there is greater pressure to rectify malfunctions as quickly as possible in order not to disturb the regularity of the workflow. In the banking and insurance industries, workers are generally paced by their machines. The average time taken to perform a transaction is very much less than before. Machines are generally much faster, more consistent and more reliable than people to work with (except when they are not in working order, which can still be quite frequent) and workers experience much greater stress when having to continually respond to such a work pace. Computerisation has also led to greater use of shift work and weekend work for "white-collar" as well as "blue-collar" workers.

The greater capital investment in labour processes and the greater management control over them has certainly increased the responsibility of all workers in a computerised industry, to work fast, consistently and accurately. Employers have attempted to equate this increase in responsibility with an increase in skill. However, the discussion on deskilling above should make it clear that such an equation is illegitimate.

Job satisfaction

As "work" becomes trivialised and routinised for more people, at the same time as its pace and responsibility intensifies, there are good reason for questioning the ability of the new technology to improve working life and make it more enjoyable.

As for the health and safety of work, there are certainly cases where automation has allowed workers to be moved away from dangerous, excessively hot or cold or polluted work environments and into air-conditioned control rooms or offices. However, workers are also discovering harmful health effects associated with continuous operation of such new equipment as word processors and visual display terminals, and work in air-conditioned atmospheres. The use of science in the service of capital to create new materials, chemicals, products and technologies has resulted in the proliferation of many substances and techniques in the workplace long before adequate knowledge of their possible toxic effects can be established.

Homogenisation of work

The main effects of computerisation on the organisation of work have been described as: optimisation, standardisation, formalisation, and specialisation. As computerisation spreads, these effects are being felt across all industries to the extent that the differences between them are beginning to evaporate while similarities grow. For instance, one can anticipate a time when, to all intents and purposes, the steel, coal and finance industries (say) will be the same because they will be staffed by crews of repair and maintenance workers whose tasks are to monitor and service machines; and groups of planners and decision makers whose tasks involve a response to regular reports on their visual-display terminals on production targets, output, sales and investment options.

Maintenance work is essentially the same, whatever the industry, and clerical work is increasingly becoming so as it consists more and more of a feeding-in of information to the computer, and a reaction to what the computer presents as a result of its processing of that information according to predetermined rules. The content of the information tends to become irrelevant to the mass of clerical workers who have to process it. Already one can see a merging of the communications and computer industries; and the expansion of electronic funds transfer systems will break down some of the divisions
between the finance, retail and communications industries.

This homogenisation of work can theoretically lead to a greater flexibility in the organisation of work. Whereas the organisation of production work is relatively inflexible, being based around fixed structures such as ovens, furnaces, mills and mines, the organisation for maintenance work can take varied forms, ranging from extreme centralisation to extreme decentralisation. The move by many companies to divest themselves of some construction, maintenance, cleaning, and other such operations and to use contractors and sub-contractors instead is one indication of a shift from a centralised to a decentralised organisation of these functions.

Computer technology can also theoretically allow clerical and some engineering work to be performed in the home instead of in a centralised office. A move in this direction is already under way in the US.

The choices as to whether centralised or decentralised work organisations are adopted will tend to be made along the same political/economic lines as those which decide which new technologies are researched and developed, and how they are used. While the gathering together of workers in factories was an important means by which capitalists in the Industrial Revolution of the nineteenth century asserted control over workers and their product, it seems technically possible for them now to control work done in the home through monitoring systems built into the machines, and at the same time benefit from the considerable advantages they can reap from keeping workers isolated and, presumably, non-unionised and unorganised in their homes.

The sexual segmentation of work

While the processes of mechanisation and automation in the rural, mining and manufacturing industries have mainly affected males (purely because they have traditionally been stereotyped as “male” work), the computerisation of the finance and other “white-collar” industries such as retail trade and public administration can be expected to have a devastating effect on the job opportunities of women who have, in Australia, been segregated to a great extent in these clerical and sales occupations.

The decline in job opportunities overall appears to have revived traditional prejudices against the paid employment of women (especially married women) on the grounds that they are “not worth training because they leave to have babies”. The rapid increase in female unemployment is already becoming marked. There are great dangers that the process of women’s liberation, supported by the growing economic independence of women during the 1960s and 1970s, will receive a major setback because of the effects of technological change.

Social Implications of Computerisation

Predictions of the social impact of computerisation under capitalism are now surprisingly similar, whether made by researchers working on behalf of trade unions or computer scientists themselves. They forecast a society divided into those without work, poor and alienated; those “lucky” enough to have (degraded and deskilled) work and whose fear of being unemployed keeps them little better than slaves; and the small group of controllers whose decisions affect the membership of the other two groups.

The concerns raised by such a forecast can be summarised under two broad themes: equity and social control. However, as the discussion that follows will show, these themes are related by the key question of access to, and control over, information and power.

The greatest social impact of computerisation (combined as it will be with the effects of the severe recession of the 1970s, and the international restructuring of industry) will be that of large-scale unemployment or under-employment. The
irony of the situation is that while thousands are laid off work, those who still have jobs have to work under greater pressure.

Computerisation has led to the elimination of many of the jobs which served as training ground for young people leaving school. The exploitation of youth in part-time casual work in fast-food outlets and supermarkets is widespread. Under such working conditions they will be isolated from the opportunity to learn from experienced trade unionists how to work collectively to better their conditions and pay. For school-leavers the prospects of a future based on either unemployment or super-exploitation can lead to drug-taking, violence, apathy and/or suicide. Since there are no adequate social planning mechanisms under capitalism, often the training a young person might be given is useless after the training period, because jobs are only available for those “with experience”.

For older people suddenly retrenched, or whose skills have been made redundant, the trauma can be very great. The concept of life-long education has been peddled by a variety of authorities — governments, employers and educators. For people in such positions, retraining doesn’t constitute any sort of threat and may even be welcomed as a relief from a job that has become routine. However, it is usually the people least confident about, and competent at, schooling — working class people, immigrants, and more often women rather than men — who are forced into the intolerable position of having to train or retrain, often at their own expense, or else to live an impoverished existence on the dole. The recent cuts in education expenditure announced by the federal government make the promises of retraining and life-long education even more of a mockery.

For the young and old without jobs, and for those in employment whose work constitutes no form of enjoyment or challenge, but is purely a source of income better than the dole, there is generally no question of choice in their way of life. The lack of equity in this case is a result of a prior situation in which decisions about which techniques are to be developed and how they are to be used have been taken by small groups of executives in the head offices of large corporations. In planning for the future of their own enterprises, these planners do not (have to) take into account the overall social impact of such decisions spread across many or all enterprises.

The other major social concern about computers is related to the question of privacy. In an excellent analysis of the question, Kerstin Aner of Sweden has noted that:

Privacy is not an ancient and eternal idea .... The concept arose with the bourgeois family and the modern press. That is not to say it is not a necessary concept or demand in our age, but we must see it in perspective. The important danger about invasion of privacy by electronic means is that it is a mass invasion, and that it cannot be returned on the snooper.

This inequality of access to, and control over, information is what the struggle is really about, not so much about control over details of one’s individual private life.

Implications for socialist theory and practice

These effects of the present stage of capitalist scientific and technological development serve to confirm the view of the early British philosopher of capitalism, Andrew Ure, expressed in 1835, “that when capital enlists science in her service, the refractory hand of labour will always be taught docility”.

It is becoming increasingly apparent that the results of decisions which are made to allocate resources to research and development of some technologies (e.g. nuclear power) and not others (such as solar or wind power) systematically enhance the power of the ruling class and correspondingly weaken the working class. Similarly, the combination of the introduction of new equipment with management processes that divide jobs into the many with limited
understanding of the overall operations of the industry, and the few with a high degree of power and control, are serving to weaken the knowledge and control over the labour process of the working class, in the interests of the national and multinational ruling class. This class nature of scientific and technical development is now becoming more apparent to wider sections of the Australian labor movement.

Such a view of the political nature of the design and use of science and technique is directly opposed to that held by Lenin in 1918: "The Soviet Republic must at all cost adopt all that is valuable in the achievements of science and technology in .... the field of analysing the mechanical motions of work .... We must organise in Russia the study and teaching of the Taylor system and systematically try it out and adapt it to our own ends". Such a belief that there is a "rational" or "scientific" method of organising work based on the division of labour that is somehow neutral of class power was wholeheartedly rejected by Australian workers represented at a federal unions' conference on technological change held in March 1981. Their statement included the following passages:

Conference draws attention to the increasing use of new technology and "systems engineering" to impose worker subservience to the machine; "built-in" surveillance; time and speed control over the worker; fragmentation and greater division of labour including mental labour; dehumanisation of relations between people and the workplace; inadequate health and safety protection; low standard ergonomics; both subtle and direct attacks upon unionism and solidarity.

Conference sees this as an example of the employer exercising class power in the workplace and an attempt to remove any vestige of workers exercising any control over their work; all in the guise of technology and systems engineering. It is an aspect of technological application that should be rejected, as time-and-motion study and so-called "scientific management" Taylor systems were rejected in the past.

The political, economic and social consequences of the present developments can be highly dangerous both for the
prospects of democratisation and liberation of society through the agency of the working class and its allies, and for the very survival of humanity. As we have noted — and in contradiction to Marx and Engels’ hopeful views in the Communist Manifesto that “The advance of industry, whose involuntary promoter is the bourgeoisie, replaces the isolation of the labourers, due to competition, by their revolutionary combination, due to association” — the new technology can be and is being used to atomise, weaken and disarm a great proportion of the working population. Technical surveillance and social control methods are increasing in power and sophistication by the day. The sheer magnitude and entrenched nature of the combined efforts of scientists and technologists in both power blocs to use their skills in support of warfare tends almost to pre-empt the possibilities for redirecting science and technology in more socially useful and desirable directions.

And yet, a more dialectical analysis will show that within these developments, more hopeful possibilities exist. The degradation of much intellectual work has contributed to a process of radicalisation and politicisation of many technical and professional workers in Australia. Attempts to atomise these workers as well are being resisted in a highly creative and conscious manner. In the past few years, “white-collar” unionism and female unionism has grown dramatically, both in numbers and militancy. More and more, white-collar unions are recognising a unity of interest with their blue-collar counterparts and are seeking joint action. There are moves for combined action between public and private sector workers. Organisationally, these are resulting in mergers between the “peak” union councils of blue-collar workers (the Australian Council of Trade Unions), white-collar private sector workers (the Australian Council of Salaried and Professional Associations) and federal public servants (the Council of Australian Government Employees’ Organisations). At another level, telephones, planes and computers are being used to unite workers nationally, and internationally too.

Potentially, one of the most important developments, as far as the prospects for socialism are concerned, has been the spread of Workers’ Research centres and similar organisations throughout Australia — organisations which bring together politically committed research workers, and workers in the manufacturing, transport, communications, energy and other industries, to jointly investigate questions such as the ownership, control and direction of their industries. Through this process of joint research and action it is hoped that the barriers between manual and mental labour, basic to all class societies, can begin to be broken down.

The computer is perhaps a unique symbol of the dialectical possibilities facing humankind at this stage of its history (or pre-history). Being a means of storing, processing and transmitting information, a means by which ruling class ownership and/or control of the means of production is legitimated, it offers a future of either increased centralisation of control and power (the capitalist scenario) or a decentralisation of information and a diversity of power structures at various levels — local, regional, national and international. The latter is the form which communists in Australia now believe is the most desirable and necessary for the socialist movement to take.

The process of deskilling to which the computer contributes, and which most unions decry at present, perhaps also has its dialectical opposite that is highly favorable to the long-term achievement of communism. This is the breakdown of “professionalism”, intellectual secrecy and elitism, though, for example, computer-aided diagnostic systems which allow accurate self-help in health matters, or computer-aided design systems which will allow communities to quickly learn planning and decision-making skills, and have equal and universal access to planning data. The rapidly-reducing costs of computer hardware now appear to make the widespread availability of this technology possible throughout the world, thus breaking
down the divisions between the information-rich and information-poor, both within nations and across nations.

In order to block the capitalist scenario, the state ownership and control of the means of production is certainly necessary but not sufficient — a conclusion that is becoming apparent to communists in both the advanced capitalist countries, and in Eastern European countries. There is an urgent need for socialist systems analysts and computer programmers to develop appropriate software for the new technology — appropriate, that is, to the conscious aim of socialising the power of appropriation of information and decision-making concerning the natural and social environments.

It seems possible that it is only now, in the computer age, that the vision of Marx and Engels in The German Ideology can become a reality:

This "alienation" .... can, of course, only be abolished given two practical premises. For it to become an "intolerable" power, i.e. a power against which men make a revolution, it must necessarily have rendered the great mass of humanity "propertyless", and produced, at the same time, the contradictions of an existing world of wealth and culture, both of which conditions presuppose a great increase in productive power, a high degree of its development. And on the other hand, this development of productive forces .... is an absolutely necessary practical premise because without it want is merely made general, and with destitution the struggle for necessities and all the old filthy business would necessarily be reproduced; and furthermore, because only with this universal development of productive forces is a universal intercourse between men established, which produces in all nations simultaneously the phenomenon of the "propertyless" mass (universal competition), makes each nation dependent on the revolutions of the others, and finally has put world-historical, empirically universal individuals in the place of local ones.

The technology of the computer, communications satellites and cable television has made the "universal intercourse between men" a reality through the imperialist linking of national economies across the world. At present this technology is under the control of minority groups in society, whether in capitalist or post-capitalist countries, making the majority "propertyless" in information and control. The urgent task before us is to act through unions, political parties, the women's movement and all other organisations which seek to increase the political awareness, confidence and capacities of the under-privileged groups in capitalist and other class societies. We have to assert our rights to understand and control science and technology in the interest of serving human need and the production of use values, rather than maintaining the division of labour that perpetuates class societies. The processes of democrationisation of information and power, and self-management in the workplace and home, offer the only viable future for the world.