COMMISSION FOR THE FUTURE

Australian attitudes to science and technology and the future

A report for
the Commission for the Future

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FUTURE CHALLENGES FOR AUSTRALIA

AUSTRALIAN ATTITUDES TO SCIENCE AND TECHNOLOGY AND THE FUTURE

A REPORT TO THE COMMISSION FOR THE FUTURE

A review and analysis of recent survey information on the attitudes of the Australian public to the future, scientific and technological advances, and a number of specific S&T-related issues.

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CONTENTS

SUMMARY AND DISCUSSION 1

CONCLUSION 5

INTRODUCTION 7

THE FUTURE 9

SCIENCE AND TECHNOLOGY
- Public attitudes to S&T 12
- Science, technology and the future 15
- The scientist's image 19
- International comparisons 20

S&T-RELATED ISSUES
- Pollution and the environment 23
- Nuclear issues 25
- Automation and jobs 27

TABLES 30

REFERENCES 33

ATTACHMENT 1
- Children's views of the future

ATTACHMENT 2
- Changes in community attitudes to technological developments in Australia, 1983 to 1987

SUMMARY AND DISCUSSION

Australians applaud technological progress, and fear it.

Information from recent surveys shows that we generally regard science and technology as a good thing, but feel threatened by their growing and seemingly uncontrolled power.

While aware that scientific and technological developments have improved our lives in many ways, we worry that they are also changing life in unintended and undesirable ways. Many of us appear to regard the future with a pessimism or unease nurtured by bleak visions of a world where machines have won, and people and nature have lost.

This anxiety may be heightened by the fact that few of us feel we are very well informed about science and technology. And most seem unaware, or unwilling to accept, how much technological change will affect us personally.

Generally speaking, support for science and technology in Australia is greater than most people think, with most Australians favouring a stronger effort in research and innovation.

More than half of us believe that technological developments have more benefits than disadvantages (55%), that more emphasis on developing new technology would be a good thing (59%), and that funding for scientific research and new technology should be increased (56%). Less than 1 in 10 believes that technological developments have more disadvantages than benefits (9%), and that funding for science and technology should be cut (9%).

Yet Australians' perception of the impact of technology appears to be strangely distorted. We rate new technology as one of the most important means of solving social questions, whereas history has shown that such technical fixes rarely, if ever, work. On the other hand, almost two-thirds of us (63%) do not think technological changes will affect our own jobs or "main activity", suggesting there is a long way to go before we accept that technology is making the notion of 'one job for life' a thing of the past, and that increasingly education and training will become a life-long process.

This attitude was noted by the OECD examiners in their 1986 report on Australian science and technology policy (1). They said they had been struck by "what seemed to be a widespread Australian view of technology as in some sense external to national life":

> "The somewhat remote Australian attitude to technology seemed to us to lead to a consistent undervaluation (and to some extent also a misinterpretation) of national technological achievements and possibilities....technology was seen as the concern of a few highly skilled workers, rather than as a process which transforms all aspects of education, training, consumption, industrial relations and social or civic life."

The explanation for this attitude may lie in our lack of knowledge about science and technology. Overall, almost half of Australians admit to being poorly informed about the subjects, according to one survey. Of particular significance, given the importance of scientific and technological developments to our economic and social well-being, is the level of ignorance among our leaders.

Only 1 in 10 leaders in business, government and trade unions considers himself or herself to be very informed about science. Four out of 10 leaders say they are poorly informed about science, a far higher proportion than for the other issues included in the question, and the only subject about which leaders know as little as other Australians. Next comes computers and automation, about which a quarter of the leaders admit to being poorly informed.

This situation may now be improving, given the growing interest in science and technology in these circles. But the finding offers a simple explanation of why Australia's scientific and technological resources are under-utilised; why Australian industry's capability in this area is amongst the poorest in the industrial world; and why government has, until a few years ago, seen little need to do anything about the situation. And this, in turn, explains in part why we are now facing such serious economic problems.

Nor, given this level of ignorance, is it surprising that, according to one study, many of us feel badly let down by our leaders over the lack of planning, management and education associated with technological change in this country.

But despite the ignorance, and for all their allure, Australians are aware that the fruits of scientific and technological progress have come at a price.

The worries about science and technology (with the exception of the nuclear threat) do not surface in surveys which ask people what their major concerns are, or to which issues Governments should give priority; more immediate and more personal problems such as unemployment, tax, drugs, inflation etc tend to prevail. But these issues are symptoms - effects, not causes. Probing deeper, one concern about technology, at least, emerges.

Unemployment often tops the list of Australians' concerns, and we regard technological change as among the main causes of it. (We do not, however, see slowing the introduction of new technologies as a useful means of combating unemployment. It seems we feel technological change is inevitable, unstoppable; we might also recognise that the cure would be worse than the disease.)

Generally speaking, however, the concerns about science and technology are too fundamental to our technological society, and often too vague to show up in questions about what worries people most. But they are expressed, implicitly or explicitly, in answers to other questions.

About the same proportion (roughly 60%) that support a greater emphasis on developing new technology also agree that through science and technology we have unleashed powers beyond our control; that we are gradually being taken over by machines; and that these days everything is changing too fast. Even more (77%) say a simple, more natural lifestyle would be a good thing.

One study, based on group discussions rather than a statistical survey of a large number of people, concluded that Australians accept the growing use and sophistication of technology at a "rational" level, but at an "emotional" level feel threatened and worried by it.

But this ambivalence towards science and technology, which has also been found in overseas studies, also reflects their dual nature - that is, their capacity to do, or be used for, both good and ill - and a very real problem in controlling technological change: the benefits of introducing a particular technology are specific, obvious and easy to measure; the costs are often diffuse, hard to measure, and often only become apparent long after the technology's introduction.

Science and technology, especially in the guise of nuclear weapons, pollution and computers, but also because of the uncertainties created by the accelerating rate of change for which they are responsible, appear to be a major source of the pessimism many Australians feel about the future.

Survey findings indicate that we are overwhelmingly optimistic about our own personal future: "she'll be right" remains the byword for about 90% of us. But at a broader level many are uneasy about where society is going, and the pace at which it is heading there. At this level, according to one study, we are more inclined to believe, "she's out of control, so why worry?".

One survey suggests only a tenth of people between 18 and 24, and a quarter of those between 25 and 34, believe that "things will continue to get better" in the future. About 6 out of 10 agree that our children will have a more difficult life than we have today, and that the future is so uncertain that it is better to live from day to day.

In fact, many of us prefer not to think about the future, feeling that coping with the present is taxing enough. Others say the changes we are experiencing are no more dramatic than those of the past, and that whatever adults may feel, children will always cope with their environment, whatever the changes.

Yet the growing domination of science and technology over our lives, and the pessimism it provokes, is nowhere revealed more graphically than in two surveys in which primary and secondary school students were asked to describe the future. Some, usually the younger ones, see an exciting world of space travel and beaut new gadgets, a place where people have it easy while machines do all the work.

But for many the prospects are very different. The world of the future, of their adulthood, is one devastated by nuclear war, a world in which nature has been plundered and destroyed, and in which computers and robots have consigned many people to the scrapheap. (To these horrors we could doubtless now add AIDS.)

Many are visions of hopelessness and despair. Many of the teenagers in one study could not imagine, even when asked, a peaceful and desirable future. According to the authors of the studies, the visions are not mere science-fiction fantasies, but reveal real fears that may be profoundly affecting the students' attitudes and development.

If this is the case, the desolate images of the young also reveal something else: if we want to create a better future for Australia, a future our children will look forward to, we will have to pay much more attention to science and technology.

The task we face poses a major challenge to our leaders, one which they have only just begun to address in recent years. Australians want better leadership in determining how this country uses science and technology. As one study has noted, without this leadership, we will be more than ever convinced that we are the victims of technology, not its masters.

CONCLUSION

At about the same time as some of the surveys covered in this report were being carried out, the science writer, Isaac Asimov, wrote on the importance of popularising science in the leading science journal, Nature (2). For better or worse, he said, science and technology had taken over the world, and whether humanity used them for civilisation's benefit, or its destruction, was a choice that could not be left to "the blind gropings of ignorance."

He went on to say:

> "This is not to say that we must build a world of scientists....But at least let the public make up an intelligent and informed audience. Football games are watched by millions who cannot play the game themselves, or even direct one successfully - but who can at least understand enough to applaud and to groan at the proper places."

Asimov's analogy is not entirely apt: cheers and groans don't have much effect on the outcome of the game. Australians certainly need a better understanding of the strengths and limitations of science and technology, but we should not simply be informed spectators. We should all also be more involved in making the choices about the broad priorities, directions and applications of science and technology.

In the past few years there has been a quite dramatic increase in interest in, and discussion about, Australian science and technology. But the debate has focussed almost exclusively on their economic importance, their role in enhancing our industrial competitiveness.

This development may have strengthened public support for science and technology. At the same time, it may have accentuated public concerns about the growing dominance of science and technology over our lives. Any such changes will be assessed in a survey of public attitudes that the Commission for the Future proposes to carry out in the next few months.

Whatever the result, it is clear from the information considered in this report that community understanding of, and involvement in, science and technology are still far from adequate. A later report from the Commission will examine strategies for achieving this sort of involvement.

The initial task must be to widen public debate about science and technology beyond the economic considerations that now dominate discussions.

Community, youth, consumer and environmental organisations, as well as trade unions, industry bodies and politicians, should put more effort into promoting discussion, and policies, on all aspects of science and technology. The findings also have obvious implications for education authorities in setting school curriculums.

Only when science and technology are given this sort of priority will they be used most effectively to improve not only our industrial competitiveness, but also the management of our resources, the protection of our environment, and the health, safety and well-being of the Australian people.

And only then will Australian science and technology attract the interest and support they deserve, both financially and through the recruitment of more of Australia's brightest young men and women.

INTRODUCTION

The Commission for the Future was set up in 1985 to increase public awareness and understanding of science and technology, and to increase community involvement in deciding how science and technology are used to shape our future.

As part of this role, the Commission will soon carry out a survey of public attitudes towards science and technology, and the future. This report is an analysis of available information on these subjects. It will provide a useful yardstick in measuring any changes in public attitudes in recent years, during which time there has been considerable debate in Australia about science and technology: a debate that has resulted in much more media coverage, new government initiatives and greater industry activity.

The report draws on and discusses information from several wide-ranging surveys about Australian attitudes and values, as well as several more specific studies. The main sources are:

The Australian Values Study. A survey based on interviews with 1,200 Australians aged 14 and over, and questionnaires returned by 940 of these people, and carried out in 1983 as part of a major international survey to compare fundamental values in different countries. Results became publicly available in 1986.

The Changing Australian. A two-part survey carried out in 1983, covering 230 leaders (senior or chief executives of companies, senior federal public servants and trade union officials) and 870 people aged 16 and over who were working or seeking work.

The Australian National Social Science Survey. A 1984-86 survey of 3,000 people aged 18 and over. Full results became available in 1987.

An unpublished survey of 1,000 adult Australians, concentrating on conservation and environmental issues, carried out by George Boniecki, of the Centre for Environmental Studies, Macquarie University, during the late 1970s and early 1980s.

Two surveys carried out since 1983 in which a total of about 1,500 primary and secondary students have been asked about their views of the future.

> Two studies carried out in 1981 and 1986 by the Centre for Communication Studies as part of their social research program, The Mackay Report. The reports are usually available only to subscribers.

Some of the findings included in this report have received some media publicity before. For example, surveys about specific issues such as the environment and uranium mining tend to get a fair amount of media coverage. However, most of the information, particularly that concerned with science and technology, has not been publicised. And to the best of my knowledge, this is the first time all this information has been brought together and discussed.

The response to survey questions can depend critically on their precise wording. For this reason, while it would be too cumbersome to include every question in its entirety, I have kept, as much as possible, to the wording used in the questions.

The percentages do not necessarily add up to 100 because figures have been rounded off to the nearest whole number and, in many instances, the percentage of people who were non-committal (for example, those saying they didn't know or who neither agreed nor disagreed with a statement) has been omitted.

Finally, I would like to thank all those who helped me to compile the information for this review, particularly Petah Digby, Noel Wilson and Hugh Mackay, whose work is cited, and Perry Sperling from the Social Science Data Archives at the Australian National University.

THE FUTURE

"She'll be right" aptly describes the attitude of most Australians towards their own personal future. At the broader social level, however, many appear to have misgivings about where society is heading, and some surveys reveal a high degree of pessimism about the future, particularly among the young.

The 1983 Australian Values Study Survey (AVSS) (3) found that 9 out of 10 Australians were happy, pleased with their lot in life and satisfied with their standard of living. The same proportion agreed that "generally things will sort themselves out and come right in the end somehow" and that they usually believed their future would be bright.

Nonetheless, roughly 6 out of 10 Australians believed that everything was changing too fast these days (61%); that the future was so uncertain that it was better to live from day to day (60%); and that less emphasis on money and material possessions would be a good thing (65%). Almost 8 out of 10 (77%) would prefer a simple and more natural lifestyle.

Four in 10 (39%) thought that by returning to the standards of our grandparents, Australia would be a better place to live; and 28% believed Australia had a duty to accept a lower standard of living for the benefit of poorer nations. About half (51%) said people should accept a lower standard of living for the benefit of the whole Australian economy.

Seven out of 10 (73%) said society must be improved gradually by reforms, with only 4% opting for radical, revolutionary change, and 23% for defending present society against all subversive forces.

An Age Poll (4) in 1979 of Australians' attitudes to the 1980s found that while they they were pessimistic about Australia and the world, Australians were rather more optimistic about their own personal lives. For example, only 18% said living standards in Australia would improve in the 1980s, while 38% said they would fall. But 32% said that personally life would be better and only 15% said it would be worse.

A survey carried out by Boniecki (5) in the late 1970s and early 1980s found a high degree of pessimism about the future, particularly among young Australians. Only 11% in the 18-24 age group agreed with the statement that, "I am optimistic. All through history things have been getting better and will continue to do so." In the 25-34 age group, only a quarter agreed with the statement, while the only group in which a majority (57%) were optimistic was the 55-and-over group.

Almost half (48%) agreed that tomorrow's world would be an ever-increasing mess of lawlessness and disorder, with 33% disagreeing with this statement. And 6 out of 10 felt their children would generally have a more difficult life than they had today.

Boniecki's survey covered attitudes to specific policy options related to conservation and environmental issues. He concluded that Australians were concerned about the future, and willing to make short-term individual sacrifices to improve long-term prospects for the community as a whole, if given direction by their leaders.

The unease and pessimism felt by Australians about the changes taking place in Australian society has also been recorded by The Mackay Report, a qualitative analysis of middle-class Australian attitudes based on group discussions.

A 1986 Mackay Report, "Contemporary social issues" (6), found that Australians had been experiencing so much social and technological change that "life seems less stable...and a vague sense of anxiety is being widely experienced". Participants in the study evaded talking about the future, feeling that coping with the present was difficult enough. This reluctance to think about the future was "the most worrying aspect of the report", Mackay states in a postscript.

But when they did confront the future, it was generally with feelings of pessimism, fatalism, and impotence. Australians believed they were losing control of their own destiny. The notion of "she'll be right" was giving way to the idea of "she's out of control, so why worry?".

Much of the discussion about the issues, which included politics and the economy, family values, education, unemployment and drugs etc, was, in fact, concerned with forgetting about them! Some parents noted their own children were sometimes more serious about the issues than they were.

This may well be true. The 1985-86 Priority One national phone-in (7) prompted almost 26,000 calls about the issues that affect young people. Overall, for those 25 and under, international issues (which included nuclear, conservation, environmental and peace issues) were the third most frequently raised topic, after education and jobs. Among those under 15, international issues made up the top topic of discussion.

A 1983 study by Digby (8), commissioned by the Australian branch of the Medical Association for the Prevention of War, surveyed 320 Year 5 and 6 Sydney primary school children, aged 10 to 12, about their views on the future and the likelihood of war.

Digby analysed the responses to questions asking the children to describe what the world would be like when they grew up, and in what way they would like the future to be different, in terms of both their general "flavour" of optimism or pessimism and whether the children saw the future as threatened.

Almost half (46%) were pessimistic about the future, while 49% were optimistic. Girls were less pessimistic than boys (42% and 50% respectively), the older children more pessimistic than the younger: 60% of boys and 54% of girls in Year 6 were pessimistic, compared to 44% of boys and 36% of girls in Year 5.

Four in 10 of the children (40%) saw the future of the world as threatened, with the prevalence of this perception increasing markedly between Year 5 and 6, particularly among girls: 49% of Year 6 boys and 57% of Year 6 girls saw the future as threatened, compared to 40% of Year 5 boys and 31% of Year 5 girls.

Digby concluded from answers to another question about what could be done to prevent bad things happening that 38% felt helpless about the situation - more than nominated effective action (30%).

A similar survey of about 1,000 older students carried out by Wilson (9) since 1983 has also revealed widespread pessimism and helplessness about the future.

Concerns about scientific and technological progress appear to be a major factor behind the pessimism of Australians towards the future. This is considered in more detail in the next section.

SCIENCE AND TECHNOLOGY

Australians appear fairly well disposed towards science and technology (S&T). The majority believe S&T benefit society and support greater funding for research and new technology. People are interested in science but do not consider themselves well-informed on the subject. They probably overestimate what technology can achieve, and underestimate its personal impact. However, the public also sees a darker side to S&T, worrying that they are becoming too powerful and that things are changing too fast.

Public attitudes to science and technology

The Australian public is widely held to be uninterested in, even hostile towards, S&T. For example, Pockley (10) wrote in 1983:

> "Over recent years...we have heard repeated justifications for the shaving and shrinking of our largely government-financed effort in research and tertiary teaching of science, on the grounds that the public is disenchanted with science....
>
> All kinds of distinguished leaders of government, the bureaucracy, science and education....have spoken of the low esteem for science, scientists and universities in the public mind. They have said this is a significant factor in weakening their claims for funds from the public purse. The claim has been made so often that it has gained a ring of truth about it."

Pockley went on to say that there was no basis for this claim, because to the best of his knowledge there had been no systematic survey of public attitudes to science in Australia.

Nevertheless, this view of the Australian public's attitude to S&T prevails. But at one level at least, it is wrong.

In the AVSS (3), about half (47%) said that in the long run, scientific advances would help mankind, about a quarter (26%) believed they would both help and harm, and a quarter (27%) that they would harm.

Women were less positive than men about science, with 43% of women saying science would help mankind and 29% that it would harm, compared with 52% of men who said science would help and 25% that it would harm. Also, the young and the elderly were less positive than the middle-aged about the benefits of science, with only 42% of those aged 15-24 and 40% of those aged 65-74 saying it would help. The most positive was the 45-54 age group, of which 51% said science would help (table 1).

About 6 out of 10 (59%) believed more emphasis on developing new technology would be a good thing, and a quarter (27%) that it would be a bad thing. More than half (55%) said technological developments had more or many more benefits than disadvantages; 32% that they had equal benefits and disadvantages; and only 9% that they had more or many more disadvantages than benefits.

Four out of ten (41%) in the AVSS strongly agreed and half (48%) agreed that companies operating in Australia should spend more money in Australia on research and development; 8% neither agreed nor disagreed, and only 1% disagreed.

More than four out of ten agreed (36%) or strongly agreed (8%) that unions should be involved in decisions about the direction that technology takes, while 20% disagreed and 8% strongly disagreed, and 25% were undecided.

Almost two-thirds (63%) did not think that technological changes would alter their present job or main activity. And of the 37% who did think they would be affected, almost half (49%) said they were not at all worried about it, while only 13% said they were very or quite worried.

Asked which of a long list of possible solutions they thought were important for solving social questions, 38% nominated new technology, ranking it third behind the education system (49%) and economic development (48%), and ahead of changes in human nature, the church, charitable organisations, dedicated visionary individuals, Parliament, law courts etc (table 2).

Almost a fifth (17%) nominated developing "research and development industries" when asked which they considered to be the most important means of generating Australia's future wealth - after developing natural resources such as coal, iron ore and natural gas (38%), and manufacturing industries (32%), but ahead of developing rural industries (15%) and service industries (7%). (The percentages total over 100%, indicating that, contrary to the instructions, some people nominated more than one area.)

The 1984-86 Australian National Social Science Survey (ANSSS) (11) found, on the question of government funding, that 56% believed too little or far too little was spent on scientific research and new technology, while 36% believed spending was about right, and 9% that it was too much or far too much.

S&T ranked 6th out of 11 areas of spending in terms of the percentage supporting increased funding, although it was only 1% behind medical care, roads and defence, for which 57% felt spending should be higher (table 3). In fact support for greater spending on S&T is surprisingly high considering that, compared to most of the other issues, S&T get little media and political attention, and most people have little direct experience of research and innovation.

In a survey commissioned by CSIRO (12) in 1984, 86% of sample groups of teachers, farmers and manufacturers (500 in all) favoured increased spending on science, far more than supported increased expenditure in other 'discretionary' areas of government spending such as arts and culture, defence, sport and recreation, and aboriginal and ethnic affairs. Only 1% favoured cutting funds for science, with 12% saying it should stay the same.

Of a group of 100 "opinion leaders" (in industry, politics, government, representative organisations, media and the scientific and academic community) surveyed in the CSIRO study, 65% were in favour of more spending on science. Asked about the appropriate balance of funding, 80% said private sector spending should be increased.

Most of the opinion leaders (61%) felt science was controlled by scientists, with 32% saying government, 3% the community and 2% user groups.

The Changing Australian Survey (CAS) (13) of 1983 found that only 1 in 10 (11%) of leaders and the workforce felt they were very informed about new scientific discoveries. About half (49% of leaders and 46% of the workforce) said they were moderately informed, and 40% of leaders and 43% of the workforce that they were poorly informed.

Out of 8 topics, science was the one about which by far the most leaders were poorly informed, followed by computers and automation (26% poorly informed), and it was the only one about which leaders and the workforce were equally ignorant. Generally a much higher proportion of the workforce than leaders admitted to being ill-informed on the subjects. Among the workforce, science ranked third in terms of ignorance, after computers (47%) and foreign policy (46%) (table 4).

Other surveys have also found a low level of knowledge or understanding of S&T among Australian leaders. For example, the CSIRO study (12) showed that while most of the leaders (80%) were able to mention at least one activity of CSIRO, Australia's largest scientific research organisation, they were often very vague, saying, for example, "something to do with wheat or wool". The other 20%, mostly in industry, had absolutely no idea of any specific project that CSIRO had undertaken.

A 1985 study commissioned by PA Technology (14) found that, compared to their overseas counterparts, Australian senior executives had an "ad hoc and disorganised " approach to keeping abreast of technological changes. Less than 10% of the Australian companies surveyed vested responsibility for monitoring technology in a member of the board or the head of a technical department, compared with almost 60% of Japanese companies.

Australian business executives regarded investment in research and development as a "reluctant tactical necessity", rather than a considered and planned strategic response to technological advancement. They were also more likely to emphasise process technology rather than product innovation, which was the wrong strategy, according to PA, and not the one generally adopted overseas.

Despite the general ignorance, one study does suggest a high interest in science in Australia, although the study's categorisation of science with medicine no doubt boosted science's rating. A 1984 survey by Henningham (15) of television journalists and viewers found that journalists ranked science/medicine 6th out of 15 categories of news, and equal 4th out of 15 in current affairs, in terms of their own interests; and 13th and 7th in terms of how they saw viewer interests. Viewers, however, ranked science/medicine 1st in both news and current affairs.

Science, technology and the future

There is, however, another side to the public's perception of S&T, and that is the concern about the unintended consequences and growing power of S&T: the sense that S&T are somehow out of control.

The responses to some of the questions about the future hint at this unease: the belief, for example, that things are changing too fast and that life should be simpler and more natural. Other questions make the concern more explicit. More than 6 out of 10 in the Boniecki survey (5) agreed that through S&T people had unleashed powers beyond their control and a similar number thought that technology was dehumanising their life and that "we are gradually being taken over by machines."

The conflict or ambivalence about science and, particularly, technology was clearly expressed in a 1981 Mackay Report, "Computers, technology and the future" (16). As already noted, The Mackay Reports are qualitative rather than quantitative studies, based on discussions with small groups of middle-class adults.

The report found that Australians accepted at a "rational" level the growing use and sophistication of technology, yet matched this with growing "emotional uneasiness":

> "The rational side of Australians acknowledges that the technological revolution is inevitable and that it is all 'part of progress'. Emotionally, however, the rate at which changes are occurring produces fear and resistance.

> Rationally, Australians recognise that the growing use of computers is potentially able to 'free us' for more leisure, more human interaction, and more attention to creative development. Emotionally, there is a fear that the very rationality of the computer age will stifle creativity and operate against 'human interest'."

When contemplating the future, Australians fluctuated between dreams of a "golden age" of "fantastic possibilities" and nightmares of a dehumanised, technocratic society, but were inclined to regard the former as a false hope. In his postscript to the report, Mackay states:

> "A striking feature of this report is the extent to which Australians speak of computers and the new technology in language laden with negative emotions: boredom, fear, violence, dehumanisation, leadership failure. The vehemence of Australians' resistance to computers and the new technology indicates that we have a long way to go before computers, in particular, are accepted as useful servants. They are still widely regarded as a disruptive intervention which seems to have caused more harm than good and, in many cases, done little to create discernible improvements in efficiency."

Among the other findings of The Mackay Report were:

. Australians felt the rate of technological change was accelerating; that recent changes were only the tip of the iceberg; and that the changes of the last 10 to 15 years would be eclipsed in the near future.

. The most obvious and most worrying aspect of technological changes was the effect on employment (see section on "automation and jobs").

. Related to this was the anxiety that new technology depersonalised society and diminished the individual.

. They considered that new technology could widen the gap between the rich and the poor, which would, in turn, increase feelings of alienation and polarisation.

. There was a widespread belief that a major war was inevitable and that computers and new technology would make it even more terrifying and devastating than wars of the past.

. Australians occasionally spoke as though they believed that the accelerating rate of technological change would lead to "some kind of overload or blow-up", and talked of "beginning again" or returning to "the simple life".

The study found that those who had used computers experienced a "leap of faith", akin to a religious conversion, leading to a rapid certainty about the value of computers and new technology. Each discussion group had at least one "apostle" of new technology who was very optimistic about the future and who tried to convert others to this viewpoint. But their enthusiasm was generally neither shared, supported nor admired by the others.

Australians felt their political and economic leaders had let them down badly by failing to plan adequately for the changes brought about by new technology. They wanted better leadership in this area, and in its absence, would be more convinced than ever that they were the victims of technology, rather than its masters.

The 1986 Mackay Report, "Contemporary social issues" (6), concluded that the findings of the 1981 report appeared to be still valid:

> "Although not looming large as a social issue, the question of computers and their impact on society did arise quite frequently in this study. ....Australians accept the inevitability of computers playing an increasing role in their lives, but they are emotionally resistant to (and often fearful of) the computer revolution. Computers are still generally seen as rather mysterious, rather threatening and potentially very powerful."

Not all were concerned. Many in the 1981 study felt present technological changes were no more far-reaching than those of the past. They believed children had always coped, whatever the changes, and would continue to do so.

Yet nowhere is the fear of where S&T progress is leading revealed more starkly than in the surveys of the views of the young about the future.

The dreams about a technological future are still there: in the Digby study (8), S&T did figure in many of the optimistic scenarios. According to a re-analysis of the results, carried out by the author for this report, about a quarter of the children (26%), especially the younger boys, were positive in their attitude to S&T generally.

However, S&T were more often seen as a threat, particularly by the older children. More than half (55%) spontaneously mentioned nuclear weapons or nuclear war. (See section on "nuclear issues" for other information on the threat of nuclear war.)

But nuclear weapons were only part of the technological nightmare. Digby's re-analysis showed that 31% spontaneously mentioned pollution or environmental destruction, and 29% job shortages that were often linked to increasing automation. These three issues were the most frequently mentioned concerns. While some seemed to welcome the prospect of machines "taking over" the world, 11% of the children saw it as a threat, and it ranked among the more common concerns:

> "When I grow up I think the world would change very much. There will be more inventions and more things we could use instead of our hands. The world would be different because I think computors and robots will take over the world. When I grow up people won't have to do anything because robots will look after us instead of ourselves."

> "Computers and robots will take over the world. Pollution will be worse, and nature will be taken over by them. More unemployment because robots will take over jobs, the government will rise tax, there will be more violence and destruction. And we might not be here if there is a world war 3! I don't think I'm going to like the new world, the new is not as good as nature and the sea and all living creatures that live in this world. IT WILL BE HORRIBLE."

> "I think it will be full of criminals and vandals. There will be many computers and we will be taken over by them. We will be lazy and fat because we will have nothing to do. The computers will over take us. There will be many more people unemployed. There will be more povity and polution. If you are well of for money it may be a wonderful world to live in. But there will only be a few I think."

As already noted, the older children in the Digby survey were more pessimistic than the younger. The survey by Wilson (9) suggests, as does the Boniecki study (5), that pessimism continues to increase as the children get older. During 1983-84, Wilson asked about 600 students aged 14 to 17 in Australia and the UK to draw, paint, write and talk about how they saw the future:

> "Over half of the scenarios were dominated by computers and robots....Over half contained landscapes of bleak devastation. Nearly all were negative and dehumanised. Most were devoid of humans. Most of the young people believed there would be a nuclear war within their lifetime and that most people on earth would die as a result of that war."

Most of the students felt powerless to change either their own futures, or the future of the world.

Wilson has now surveyed a total of about 1000 students in this age group (as well as about 200 younger students); the conclusions remain the same. According to Wilson, while concern among young people about the threat of nuclear war is not new, and has been confirmed in many countries, "the pervasive gloom over our high-technology future has only recently emerged":

> "It lurks and grows beneath beneath the glossy excitements and promises of the benefits of the computer age. Just as machines make humans redundant in many physical tasks, so does the computer make humans redundant in many mental tasks. Often young people, taking that proposition to its logical conclusion, see themselves, as people, redundant."

Where the students expressed feelings about the future they described, they were usually feelings of fear or alienation. Wilson found that the results of "open fantasies", where he asked students to picture the world in 20 years' time, were so negative that he began to ask them to imagine a peaceful and cooperative future. While some were able to do this, he says, many more could not:

> "The young people no longer believe that greater technology means greater human progress. Yet they cannot conceive of progress without more technology. So a culture without a high technological component is to them primitive, a regression, unacceptable."

This perception, he says, was summed up by one of the students, who wrote:

> "The nuclear holocaust has come and gone. Technological civilisation has survived. But the myth of goodness isn't there."

(More examples of the students' writings from both the Digby and Wilson studies are included in Attachment 1.)

The scientist's image

The image of the scientist as a person that is held by students and as it is portrayed in popular culture seems to reflect, and may also reinforce, this negative view of S&T.

In a 1986 review of Australian studies in the area, Schibeci (17) said students at the primary, secondary and tertiary levels generally had a negative, stereotyped image of scientists. For primary school children this image could be summarised as follows:

> "The scientist is male and has facial hair. Often, his work is of a secret or dangerous kind. His 'discoveries' are generally the result of a brief period of intense thinking (rarely the result of long, careful, painstaking investigation). His preoccupation with matters scientific is such that little time is available for mundane matters such as family, sport and entertainment."

One potentially powerful influence on how students saw scientists, Schibeci said, was the images of scientists in popular culture, where "scientists are usually portrayed either as mad or so dedicated to truth that they were completely insensitive to their colleagues and families."

Haynes (18), who is currently researching a book on how scientists have been presented in literature, also claims their image is stereotyped and, in contrast to earlier days, usually negative:

> "Early this century, scientists in literature were, briefly, heroes, either saving earth from evil space invaders or setting up a utopia based on the more benevolent principles of science. After Hiroshima, their moral stocks plunged: they were seen to be ruthlessly sacrificing people to gratify scientific curiosity. That stereotype was followed by the helpless scientist wringing his hands while his computers ran amok or poisonous substances from his laboratory destroyed whole cities."

Pockley and Ryan (10), in a 1983 survey of newspaper editors and news and current affairs executives in radio and television, found that they also generally had a stereotyped and unflattering image of scientists. However they concluded that there was no basic antipathy towards science in the Australian media, and that media managers were more "baffled" by science and scientists.

International comparisons

In its 1985 report, "The public understanding of science", The Royal Society of London (19) summarised international information on public attitudes to science as follows:

> "...the general public: is interested in science and would like to know more about it; tends to over-estimate the ability of science to solve what are essentially social problems; gives higher funding priority to applied than to fundamental research...; and, generally, is guardedly supportive of science while being wary of some of its applications."

Available information on Australian attitudes indicates they basically conform with this assessment.

Although the wording of the questions differed, the finding that 55% of Australians believed technological developments had more benefits than disadvantages (3) suggests that Australians are more positive than the British, only 45% of whom believed S&T did more good than harm (20), but slightly less positive than the Americans, for whom the figure was 58% (21) (table 5).

Overseas surveys have found that people may not know much about S&T, but quite a large proportion are interested, and would like to be more involved in decisions about S&T. A 1983 US survey (21) found that while only 14% of Americans considered themselves very well informed about new scientific discoveries and about new inventions and technologies, almost half professed to be very interested in these subjects (48% for science, 44% for technology).

A 1979 EEC survey (22) found that 67% expressed some degree of agreement (with 43% agreeing completely) that they found it difficult to talk about science because they did not know enough about it, while 19% disagreed with the statement. Almost as many (62%) agreed (and 20% disagreed) that "to direct scientific and technological research in the right way, it would be better to take more account of what the public thinks".

The ambivalence about S&T suggested by the Australian information is also apparent in overseas surveys. US studies (21) found that in 1983, 88% of Americans agreed that the future prosperity of the United States depended on more and better technology, and 85% that science was making their lives healthier, easier and more comfortable.

But three-quarters (74%) also thought that through the development of nuclear, chemical and biological weapons, science and technology might destroy the human race. And a 1982 survey (19) found that 77% agreed that "science and technology often get out of hand, threatening society instead of serving it".

The EEC survey (22) showed that "the image of a science that will be as beneficial in the future as it has been in the past is widely accompanied by anxiety about the growing risks that it may involve for society."

Thus three-quarters (74%) of Europeans agreed (and only 11% disagreed) that science would continue to be one of the most important factors in improving their lives, yet 67% also agreed (and only 15% disagreed) that scientific and technical development was accompanied by bigger and bigger risks for society that would be difficult to overcome.

Underlying this ambivalence is a distinction between science and its use. Over two-thirds (69%) of Europeans agreed (with only 13% disagreeing) that "scientific knowledge is good in itself; it is only the way it is put into practice which often creates problems."

More than half (57%) believed (and 23% did not) that some discoveries were put into practice before sufficient study had been made of the future consequences. Almost half (48%) were, however, optimistic that new inventions would always be found to counteract the harmful consequences of technological developments, while 28% dissented from this view.

More agreed (44%) than disagreed (31%) that sufficient care was taken in their country to ensure scientific discoveries were put to use for the benefit of the people in general. However, more than half (57%) agreed (with 18% disagreeing) that members of Parliament and other people who made political decisions did not consider seriously enough the choices involved in making decisions about science.

S&T-RELATED ISSUES

Pollution and the environment

While the environment may not rank among the top few issues concerning the Australian public, most surveys reveal strong support for increased protection of the environment.

In the AVSS (3), 44% disagreed when asked if Australia should develop its natural resources even if there were extreme environmental costs involved; 35% agreed, and 19% neither agreed nor disagreed.

Asked if Australia should concentrate more on conserving its natural heritage even if this required us to adopt a different standard of living, 44% agreed, 24% disagreed and 30% were undecided.

Almost 8 out of 10 (79%) disagreed with the statement that we are spending too much on improving and protecting the environment, while 21% agreed.

In the CAS (13), 70% of leaders and 69% of the workforce said protecting the environment was a cause "sufficiently worthwhile for you to do something about, even if this might involve some risk or giving up other things." Out of 8 causes, environment ranked 4th with leaders and 3rd with the workforce - after world peace and human rights and, for leaders, poverty (table 6).

In the ANSSS (11), half (49%) felt the government was spending too little or far too little on improving and protecting the environment, while 42% said the amount was about right and 10% felt it was too much or far too much. The environment ranked 7th out of 11 areas in terms of support for increased funding (table 3).

An overwhelming majority (89%) in the ANSSS agreed that "stronger measures should be taken to protect the environment from pollution", with only 4% disagreeing and 6% neither agreeing nor disagreeing.

However in the CAS (13), only 4% of leaders and 6% of the workforce ranked controlling water and air pollution among the three things that should be of highest concern or priority for the Federal Government. For leaders the top issues were, in order: job creation, inflation, controlling government spending, and income redistribution. For the workforce they were: job creation, inflation, controlling unions and controlling government spending.

The Political Issues Index prepared by the Roy Morgan Research Centre Pty Ltd (23) shows that conservation/environment ranks about 25th when people are asked what are the three most important things the Federal Government should be doing something about (1985 data). Reducing unemployment, lowering tax and improving education head the list.

A 1986 Victorian survey (24) showed that "nuclear issues", "conflict between the timber industry and conservationists" and "environmental issues" ranked 10th and equal 11th in a list of unprompted public concerns (being mentioned by 7% and 5% of people). These concerns were, in order of priority: unemployment; union problems and strikes; economic problems, including inflation and high interest rates; drugs and drinking; public transport; education; hospital problems; law and order; and farmers' problems.

However, the environment did rate higher than other well-publicised issues such as petrol prices, welfare, immigration, aboriginal land rights, and the Australia Card. And it is possible that the environmental 'vote' was, for the purposes of the study (which was concerned specifically with attitudes to forests and the forest industries), split among three topics: the timber industry conflict, environmental issues, and a third, woodchipping .

A 1986 survey by the Australian Bureau of Statistics (25) found that almost half (47%) of Australians aged 15 and over were concerned about the environment, with the major issues being, in order of importance, pollution (30%), conservation of flora/fauna (21%), tree deforestation (19%), nuclear issues/uranium (15%), development/planning issues (10%), soil erosion (9%), preserving buildings (8%), and water salinity (7%).

Boniecki (5) found strong support for environmental and conservation issues in his survey. For example, 71% supported more pollution-control devices wherever necessary, even if this increased prices of goods and services, and the same proportion agreed with the introduction of restrictions to preserve for the future a substantial part of our natural resources, even if this meant lower export revenue.

International comparisons: In the EEC survey (22), 80% said they were "really concerned or worried" about the despoiling of nature by pollution.

In a 1986 survey (26), 59% of Americans said too little was being spent on improving and protecting the environment, ranking it 3rd after halting the rising crime rate (63%), and improving education (60%) in a list of 15 issues.

Nuclear Issues

More Australians favour the mining and exporting of uranium than oppose it; they are divided about nuclear power, but strongly support nuclear disarmament. The threat of nuclear war ranks among their major concerns.

The AVSS (3) found that almost two thirds (64%) agreed with mining Australia's uranium (36% disagreed). When the question specified exporting uranium for "peaceful purposes", the proportion agreeing rose to 77% (23% said we should not). But 62% said "yes" when asked if there was anything about the mining and exporting of uranium that worried them.

According to the Morgan Gallup Polls carried out by the Roy Morgan Research Centre (27), the percentage of Australians who supported the development and export of uranium for peaceful purposes has varied since 1977 from 54% (1979) to 66% (1982-83). In 1986, the figure was 63%. Those opposing it have varied from 23% (1983) to 32% (1979). In 1986, the figure was 31%. The polls do not show the increase in approval that the AVSS found when use "for peaceful purposes" is stipulated; the figures for those who supported uranium mining were only 2-3% less than for those who supported its peaceful use.

Over the period, about 60% of people have agreed that they were worried over some aspect of the mining and export of uranium, often mentioning its possible use in making nuclear weapons, or the problem of nuclear waste disposal.

In the ANSSS (11), the margin in favour of uranium mining was smaller: 45% agreed with the statement that Australia should mine uranium and sell it on the world market; 36% disagreed, and 19% were undecided. 33% agreed that Australia's uranium should stay in the ground, 49% disagreed, and 18% were undecided.

The Boniecki survey (5) found that 59% agreed with postponing uranium mining and similar activities where the long-term consequences were uncertain, while 28% disagreed.

Half (51%) of those surveyed in the AVSS (3) believed that there was too great a risk involved in nuclear energy and it should not be used, while 49% favoured the statement that nuclear energy was an essential source of fuel and would have to be used despite the risks.

According to the 1981 Mackay Report (16), nuclear energy is part of some people's nightmare about the future. Australians dream of clean, non-polluting and inexpensive power - usually solar power. They fear a world which has exhausted its fossil fuels and not managed to harness solar energy, and in which there is a widespread use of nuclear power.

On the question of nuclear arms, 87% in the AVSS (3) opposed countries having nuclear arms, while 14% favoured it. 60% strongly favoured, and 19% mildly favoured nuclear disarmament, while 12% mildly favoured and 6% strongly favoured the opposite view.

However, in the CAS (13), only just over half (51% of leaders and 54% of the workforce) considered nuclear disarmament a worthwhile cause, giving it a ranking of 6th out of 8 for the leaders and 5th for the workforce (table 6). (World peace ranked 1st for both groups, with 8 in 10 saying it was worthwhile.)

Nonetheless, nuclear disarmament and the threat of nuclear war tends to be the only issue of those considered in this report to rate fairly high among public concerns. For example, nuclear war/disarmament ranks about 10th in the Roy Morgan Political Issues Index (1985 data) (23).

Two surveys of 2000 people aged 15-24, commissioned by the Office of Youth Affairs and carried out in 1984 and 1986 by ANOP Research Services Pty Ltd (28), found that in 1986 9% mentioned nuclear war and related concerns when asked about the most important issues or problems affecting young people generally, compared to 4% in 1984. It ranked 6th in 1986 in a list headed by unemployment, lack of money, and drugs.

When given a list of 8 areas of possible concern, almost two-thirds (65%) in the 1986 survey said they were "personally worried very much or quite a lot" about the possibility of nuclear war, ranking it 3rd after hard drugs and unemployment. In 1984, the figure was 73%.

According to ANOP, while concern about nuclear war "is perceived more frequently in 1986 than in 1984 as an issue for young people generally, young people's level of personal worry of perceived threat has declined - suggesting that the issue has received increased media attention but that young people have become more inured to the possibility of nuclear war."

Similarly, 53% of young people in 1986 believed nuclear war was "very or fairly likely" in their own lifetime, compared to 63% in 1984. An additional survey in 1986 of 1000 people aged 25 and over showed only 26% of this age group thought nuclear war was likely.

The 1986 Mackay Report (6) on social issues found that the possibility of nuclear war or a catastrophic nuclear accident was mentioned in passing in many of the discussion groups. The report said that the more serious and disturbing the issue, the more fatalistic was the response. The threat of a nuclear holocaust, representing the ultimate threat, elicited the most extreme fatalism.

International comparisons: On the question of nuclear energy, 44% in the EEC study (22) said that developing nuclear power stations was worthwhile, while 36% said it entailed unnacceptable risks. In a 1983 US survey (21), 48% said nuclear power would make the quality of life better, and 44% that it would make it worse.

Automation and Jobs

Australians regard new technologies as an important, but not the most important, cause of unemployment. They both accept this, and worry about it. They do not rate restricting technological change as an important means of reducing unemployment, but believe the changes need to be much better managed, and more support given to those affected.

In an open-ended question in the CAS (13), the technological revolution/computers/automation ranked 4th out of 24 causes with both leaders and the workforce in terms of the number (15% and 11% respectively) nominating it as the main cause of Australia's present high level of unemployment. The recession/downturn in the economy was mentioned most often by leaders (36%), while unions/strikes/wage demands topped the list of suggestions by the workforce, being mentioned by 15%.

In an open-ended question about the main cause of high unemployment among people under 20, technological change ranked 4th among leaders, being mentioned by 18%, in a list headed by lack of experience/no opportunities, which was cited by 24%. Technological change was mentioned by 7% of the workforce, ranking it 8th in a list headed by employers not giving the young or unskilled a chance, which was cited by 17% as the main cause.

However only 9% of leaders and 13% of the workforce believed that "slowing down the growing use of computers and automation" should be one of the three highest priorities for reducing unemployment. This option ranked 13th among leaders, and 10th among the workforce, out of a list of 18 choices. "Providing incentives for commerce and industry to invest and expand their activities" topped the list for both groups, being selected by 47% leaders and 30% of the workforce.

In an open-ended question in the 1986 ANOP/Office of Youth Affairs survey (28), 16% of those aged 25 and over said increased technology, automation etc was one of the main causes of unemployment among young people, ranking it second after the apathetic attitude of the young (also mentioned by 16%). Only 5% of those aged 15-24 mentioned technology as a main cause, ranking it 7th in their list, which was also headed by the apathetic attitude of the young.

However using people rather than computers was suggested by only 1% of both age groups as a way of helping to deal with youth unemployment, coming at or near the bottom of the lists of suggestions. More training schemes and courses headed the list for both groups.

A 1978 Age Poll (29) showed that 45% of people believed modern technology should not be encouraged during periods of high unemployment, while 52% said it should be encouraged to make industry as efficient as possible.

The 1981 Mackay Report (16) found that Australians saw the increasing use of machines to do work normally done by people as part of the inevitable march of progress, something that has happened since the industrial revolution. However they were very unhappy that leaders seemed powerless to manage the changes in a way that could minimise social dislocation.

People acknowledged the theoretical desirability of having more free-time, but felt that society was ill-equipped to cope with a situation where fewer and fewer people had to work. While there was a growing sense that few jobs were safe from the technological revolution, the poorly educated and unskilled were widely seen to be "the first to go":

> "...Australians regard the re-employment of such people as being a major social problem now, and a potentially frightening problem in the future. Various solutions are proposed, ranging from genetic engineering to 'breed out people of low-intellect', to a much more generous program of social security and an active retraining program which would either prepare such people for alternative work or, more probably, train them to enjoy their leisure."

The alternative, they believed, would be major social unrest.

The 1986 Mackay Report (6) found these concerns about the impact of technology on employment remained:

> "The more computer technology promises to replace the work of humans, the more threatened (and sometimes degraded) those humans feel. Work is still the primary source of identity and self-definition for most Australian males (and growing numbers of females): the computer lurks in our future with the vague threat of robbing us of that sense of worth which work brings."

International comparisons: The EEC survey (22) found that 67% of Europeans were "really concerned or worried" about increasing unemployment due to automation. More agreed (44%) than disagreed (39%) that "it would be a good thing if the construction of so many machines could be stopped and we could go back to nature."

US studies (21) show Americans are fairly evenly divided on the question of whether science and technology lead to more employment, or less (45% and 35% respectively in 1985, but in 1984 the figures were reversed).

About the same proportion (71% and 74% respectively) agreed in 1983 that factory automation would cause substantial unemployment, and that it was necessary to make American products competitive. Less agreed (42%) than disagreed (52%) that on balance computers would create more jobs than they would eliminate, and 55% agreed and 43% disagreed that technological developments were one of the main reasons there was high unemployment in America.

TABLES

1. Value of Scientific Advances*

Group	% Help mankind	help and harm	harm
Total	47	26	27
Women	43	28	29
Men	52	23	25
Aged 15-24	42	27	30
Aged 25-34	48	27	25
Aged 35-44	49	28	23
Aged 45-54	51	20	28
Aged 55-64	47	25	28
Aged 65-74	40	25	35

*In the long run, do you think the scientific advances we're making will help or harm mankind?

Australian Values Study Survey, 1983

2. Solving social problems.

Percentage of people who considered each area important for solving social questions.*

Item	%	rank
education system	49	1
economic development	48	2
new technology	38	3
changes in human nature	31	4
church	27	5
charitable organisations	24	6
dedicated visionary individuals	22	7
parliament	19	8
law courts	18	9
Labor Party	17	10
time (problems solve themselves)	14	11
trade unions	12	12
government departments	11	13
industrial organisations	9	14
Liberal Party	7	15
Australian Democrats	5	16
National Party	4	17

*Now about how social questions are solved. Below is a list of things which some people have said have helped to solve social questions. Which, if any, of the following do you think are important for solving social questions?

Australian Values Study Survey, 1983.

3. Government spending on social issues*

Issue	Too little spent		Too much spent	
	%	rank	%	rank
dealing with drug addiction	68	1	7	8
improving nation's education system	68	2	6	10
hospitals and medical care	57	3	6	9
improving roads and highways	57	4	6	11
the military, armaments and defence	57	5	17	4
scientific research and new technology	56	6	9	7
improving, protecting the environment	49	7	10	6
pensions and other social services	46	8	15	5
providing assistance for unemployed	42	9	20	3
improving conditions for aborigines	35	10	33	2
foreign aid	16	11	47	1

*We are faced with many problems in this country, none of which can be solved easily or inexpensively. I am going to name some of these problems, and for each one I would like you to tell me whether you think the government is spending too much money on it, too little money, or about the right amount.

Australian National Social Science Survey, 1984-86.

4. How well informed people are about science*

(a) Percentage saying they were poorly informed:

Topic	Leaders		Workforce	
	%	rank	%	rank
new scientific discoveries	40	1	43	3
computers and automation	26	2	47	1
social welfare benefits	25	3	38	4
women's rights	18	4	35	6
the law	16	5	33	7
foreign policy	9	6	46	2
economics and business	6	7	35	5
trade unions	5	8	31	8

(b) Percentage saying they were very informed:

trade unions	53	1	15	3
economics and business	40	2	13	6
women's rights	31	3	16	1
computers and automation	23	4	16	2
the law	22	5	15	4
social welfare benefits	21	6	14	5
foreign policy	20	7	7	8
new scientific discoveries	11	8	11	7

*Would you say you are very informed, moderately informed or poorly informed about - ?

The Changing Australian, 1983.

5. Attitudes to S&T: International Comparisons

Attitude	% Aust*	UK#	US#
does more good than harm	55	45	58
does more harm than good	9	11	5
about equal	32	38	32

*Technological developments in Australia may have both benefits and disadvantages. How do you think technological development will affect Australia?

#Overall, do science and technology do more good than harm, more harm than good, or about the same amount of each?

6. Worthwhile causes*

Percentage who consider each idea or cause worthwhile.

Cause	Leaders		Workforce	
	%	rank	%	rank
world peace	80	1	77	1
human rights	79	2	76	2
struggle against poverty	76	3	68	4
environmental protection	70	4	69	3
Australia's defence	53	5	53	6
nuclear disarmament	51	6	54	5
sexual equality	45	7	31	8
my religious faith	31	8	37	7

*Which of the ideas or causes in the following list are sufficiently worthwhile for you to do something about, even if this might involve some risk or giving up other things?

The Changing Australian, 1983.

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ATTACHMENT 1

The following are more examples of children's views of the future taken from the survey by Digby:

"I think there will be space buses to go in space and there will be computors and TV games everywhere. There will be tubes that you get into instead of trains and cars and there will be space Olympic games. There will be robots to do everything for you and there will be computer classes instead of school. And some people will live on the moon."

"It will have different transport maybe different spacecrafts, and be easyier to go from one place to another. There might be spaceships that can take us to the moon for trips, and we can communicate more easyier with new telephones, telephone watch with a little screen. Robots to do the work, machines for scientist so they won't get hurt. There might be solar powered TV's, bycicles and cars. There might even be things you can press and food or what you want to have comes out. I think it will be good in the future."

"In the future you see space cars or space ships fly around. You can travel to the moon anytime you like. They have a lot of computers or a lot of remote controls microwave oven, dishwasher, television, telephone, and washing machine. You can have a space race through the galaxy."

"There might be solar-powered vehicles, spaceships, rockets bound for other planets, robots harvesting food, settlements on the moon and other planets, new ways of travelling, spacestations in space, new kinds of houses and buildings."

"There will be things scientists of today never thought of finding but when other scientists in the future solve the unexplained works they can invent other things such as hydro-cars, under-water cities, undefeatable weapons. They can make a wonderful city out of our world but someday the weapons, machinery that they have made could dsetroy them if in the wrong hands. There would still be hardships but it would be easier than before. We could fly in the air with hydro-jets and invent lots more things."

"When I grow up I think the world will be more computerised and the world will be run by computers. We will have more electrical appliances and there will be less jobs available. I think there will be lots of science fiction and you'd have to be very smart to get a good job for a fair amount of money. In the future I think that there will be more fashion than ever and a lot of punks. There will be bigger and better buildings and lots of shops."

"There will be many computers and metallic space rockets. Pollution will be a big problem and food will be artificial. The population will decrease because of the poisoning air they will breath. There will be WARS which will kill and destroy. There will be water shortage and the sea will be poisoned. Transport will be big because they will manufacture hi-speed trains and motor buses. I don't the you will be able to know if it is day or night because you won't be able to see the sky."

"It is going to be hard to get a job because their will be electric things. And you need to get a job to support your family. You will need to get money to pay the tax and insurance. I think it is going to be hard because of unemployment."

"There will be computers, people will get lazier. Every house will have a computer. Every thing will be made as a luxuary. Computers will take over the world and jobs will become scarce. I think there will be a depression. Houses will have to be built using more air space rather than land because the world will be over populated. Water and petrol will become very valuable."

"There will be many computers and mass unemployment. Space technology will be highly advanced and (nuclear) energy will be used for peacful and unpeacefull porposes. Food etc will be expensive etc. You may be able to take space holidays. Polution will be high and families will have few children because of the expense and the population will decline slowly causing the end of the world. You may be educated by computers. Stronger metal will be manufactured."

"I think people will go to different planets and there will be massive space stations and people will live in them. I also think a lot of nature will face extinction and technology will take over the earth. I think in the future everybody will live in huge units and nobody in proper houses. I think we will come very close to a nuclear war and I'm not sure if we'll avoid it."

"When I grow up I think that there's going to be a war and everyone in Australia is going to die. I know it's not a very nice thing to say but that's what I think is going to happen. Then there's going to be a lot of young children dying, which is sad and the same with adults and pregnant people. Plus I know that we'll go to heaven with my friends and family and everyone else."

"The world I think when I grow up will be very different. Less jobs for people. Either very rich people or very poor people. Lots more people dying of drugs, accidents, smoking. I know, I just know there will be a world war or lots more world wars in the future, or maybe something somewhere will stop wars, I'm not sure. I'm very frightened of world wars. I'm afraid of a bomb dropping on us and lots of Australians dying."

"The world will be a wreck - there will be dead creatures everywhere, and the USA will get blown off the face of the earth. Mankind will be blowing up each other with deadly gases and all sorts of bombs. There will be creatures from other planets invading and no-one will survive. Everyone who thinks there will be flowers and birds are wrong, there will be destruction, death and diseases, and everyone will die painfully. Those who survive will be taken by God but there will only be a few."

The following are extracts from the writings of students aged 14-17 from the study by Wilson:

"We have robots to do all the work and we take a pill instead of dinner because that has all the necessary vitamins. We have a liquid drink that also has vitamins. We have a much larger population with bigger apartments for everyone to stay in. It is a very peaceful world."

"His voice went on and on mumbling about a war to end all wars and of computers, the dreaded boxes he called them. 'Earth's technology went way beyond our years,' he said. 'Too fast,' he mumbled and off went his voice into that incoherent mumbling. I sat perplexed, unknowing and almost afraid."

"I saw a world desolate of people, grey and unfeeling. Existing buildings almost in ruins. Streets just for living in not to be proud of. There was no religion. No traditions. In the house I saw a large board on a wall with knobs and buttons for everything. I had a feeling of dictatorship."

"I don't like what I see because people are being outdone by machines and computers."

"In the future I saw a building. I went inside. Everything was computerised. There were robots everywhere, but they couldn't see me. I ran out. Across the road was a zoo. I went in the gate. Amongst all the cages was a tiny cage. Inside was a girl about five years old. She was the only human I saw."

"If the bomb doesn't get us, pollution, overpopulation or the robots will."

"Things weren't much different, the cars were more space-like, and all the people were wearing bright clothes. There was no trust between them."

"I saw in a valley a destroyed city. The country as far as I could see was burnt, there were no trees, bushes, animals, grass, atmosphere. I realised there had been a nuclear war of tremendous ferocity in which all living things had been destroyed. I felt anger and hatred towards everyone for what they did to each other."

"The earth is a wasteland. There is no-one left."

"I feel afraid, empty, lonely. What is left of the people are all undernourished, poor, disease ridden."

"The dust has just settled from the war to end all wars. There is nothing but vast landscape. One space ship, with one colony of survivors aboard, flies off overhead into the distance."

ATTACHMENT 2

CHANGES IN COMMUNITY ATTITUDES TO TECHNOLOGICAL DEVELOPMENTS IN AUSTRALIA 1983 TO 1987

A preliminary assessment

Richard Eckersley*

February 1988

Australians' support for technological developments has shown a substantial rise over the past four years, with the biggest increases occurring among tertiary-educated, professional people and the young.

There has been only a negligible rise in support among the poorly-educated, semi-skilled and unskilled workers, and older people. Women remain less enthusiastic about technology than men, regardless of age, education or occupation.

These are the most significant findings in a comparison by the Commission for the Future of the responses to a survey carried out in November 1987 with those obtained from a questionnaire completed by respondents as part of the Australian Values Study Survey, undertaken in August 1983.

Results

The 1987 survey was carried out for the Commission by the Roy Morgan Research Centre as part of its weekly Australia-wide "Omnibus" survey of consumer opinion trends. Roy Morgan also did the polling for the 1983 study.

In both surveys, about 1,000 Australians aged 14 and over were asked to rate technological developments in Australia in terms of their benefits and disadvantages. In 1983, 54.3% said technological developments had more benefits than disadvantages. In 1987, the proportion had risen 9.2% to 63.5%.

Support for technology is clearly linked to occupational status, education, income and sex.

The biggest increase in approval occurs among professional people - up from 66.6% in 1983 to 89.5% in 1987 - a difference of 22.9%. There was only a small, and statistically insignificant, rise of 3% in approval among semi-skilled and unskilled workers - from 51.8% to 54.8%.

Similarly, support among those with only a primary education increased by only 1.3% to 45.1%, while among those with a tertiary education, it jumped 18.1% from 62.9% to 81.0%.

A large increase in the proportion saying technological developments have more benefits than disadvantages also occurs among the young, which in 1983 had been the age group least enthusiastic about technology. Rises in the older age groups are small and statistically insignificant.

For example, among those aged 14 to 19, the approval rate increased 16.3% from 48.8% to 65.1%, while among those 65 and over, it rose only 0.5% to 59.5%.

The increase in approval of technology among women is slightly less than, but not significantly different from, that among men (8.7% compared to 9.7%). Women remain substantially less positive about technology than men, a difference that persists across age, education and occupational groups. For example, support among female professionals, managers and business and farm owners (68.3% in 1987) was higher than among semi-skilled and unskilled women (37.8%), but lower than among their male peers (89.7%).

Overall, 55.0% of women in 1987 said technology had more benefits than disadvantages, compared to 72.1% of men - a difference of 17.1%.

The shifts in opinions about technology between 1983 and 1987 mean that the gap between the most positive and the least has widened. For example, the difference between primary- and tertiary-educated people, in terms of the proportion supporting technological change, rose from 19.1% in 1983 to 35.9% in 1987.

In 1987, the biggest gulf occurs between male managers (94.7% of whom believed technological developments had more benefits than disadvantages) and semi-skilled and unskilled women (only 37.8% of whom did).

Discussion

While any conclusions drawn from these results must be tentative - being based on responses to only one question - the results are in line with what might have been expected.

On the face of it, the outcome will be encouraging for the Federal Government and the scientific and technological community, which have been trying to increase national awareness of the importance of science and technology to industrial competitiveness and hence to Australia's economic future.

One outcome of these efforts has been a marked improvement in media coverage of science and technology since 1984, and this has undoubtedly been a major factor in the shift in public attitudes.

That attitudes towards technology are most positive, and have changed most, in the higher socio-economic groups, while the perception is less positive, and has changed little if at all, in the lower, may reflect the fact that the benefits of technological change are not evenly spread through the community.

The well-educated people in higher-status jobs are those who have most say in what technology is introduced and how it is used. At a personal level, they are the ones most able to afford the latest products technology has to offer.

The uneducated and unskilled, on the other hand, are more likely to be "victims" of technology - threatened by technological change at the workplace, and too poor to enjoy its benefits in the home. Not surprisingly, they are less convinced about technology's value.

Another possible explanation for the pattern of change in public attitudes towards technology is that changes in social attitudes and values tend to begin in the better-informed, higher socio-economic groups, and spread more slowly through the rest of the community. Another possible factor influencing the results is that the less-educated may have a poorer understanding and appreciation of what technology is.

The substantial rise between 1983 and 1987 in the approval rate among young people may reflect the increasing numbers of students staying on to Year 12 at school (Year 12 retention rates at Australian schools have risen from 34.8% in 1981 to 53.1% in 1987). In other words, those aged 14 to 19 in the 1987 survey are more likely to be still at school or to have completed their Higher School Certificate than was the case in 1983. A similar case would apply, but to a lesser extent, with those aged 20 to 24.

The difference between the attitudes of men and women towards technology could be due to its "masculinity": the current domination of technology by men and their priorities, and hence its lesser relevance to women. Girls are turned off science and technology at an early age in Australia, so that even those with tertiary qualifications are unlikely to be well-educated in science and technology.

Finally, and to repeat the earlier caution, these results should not be taken as any more than an indication that public support for technology has increased in recent years.

The Commission's report on Australian attitudes to science and technology and the future, which was issued last August and which reviewed earlier survey data, showed clearly that Australians are in general ambivalent, confused and ignorant about science and technology. About the same proportion that endorse scientific research and technological innovation also agree with more negative statements about the uncontrolled power of science and technology and the uncertainties they create about the future.

There is clearly a strong case for a more thorough examination of the changes in public opinion suggested by this preliminary assessment.

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TABLES

1. Technological developments in Australia may have both benefits and disadvantages. Which one line best describes how you think technological developments will affect Australia?

Response	1983	1987
Many more benefits than disadvantages	20.8	21.6
More benefits than disadvantages	33.5	41.9
Total benefits	54.3	63.5
Equal benefits and disadvantages	31.5	27.7
More disadvantages than benefits	7.6	5.9
Many more disadvantages than benefits	1.6	1.7
Total disadvantages	9.2	7.6
Can't say/no answer	5.1	1.3

2. Comparisons based on the percentage of respondents saying technological developments have many more or more benefits than disadvantages.

Category	1983	1987	Difference
Total	54.3	63.5	9.2
Sex: men	62.4	72.1	9.7
women	46.3	55.0	8.7
Age: 14-19	48.8	65.1	16.3
20-24	42.3	56.2	13.9
25-34	57.9	62.7	4.8
35-49	60.5	67.2	6.7
50-64	63.8	65.7	1.9
65 and over	59.0	59.5	0.5
Education: primary only	43.8	45.1	1.3
some secondary	46.0	49.9	3.9
inter, 4th form	51.7	63.4	11.7
5th/6th form	62.3	67.0	4.7
tertiary	62.9	81.0	18.1
Occupation:			
professionals, managers, business and farm owners	70.2	87.3	17.1
(professionals only)	(66.6)	(89.5)	(22.9)
white collar	61.1	67.1	6.0
skilled tradesmen	70.2	72.7	2.5
semi- and unskilled	51.8	54.8	3.0
Income: less than $10,000	58.7		
less than $15,000		54.7	-4.0
$10-20,000	56.5		
$15-25,000		66.6	10.1
more than $20,000	71.3		
more than $25,000		77.8	6.5

3. Gender comparisons, 1987:

Response	Men	Women	Difference
Many more benefits	28.4	14.9	13.5
More benefits	43.7	40.1	3.6
Total benefits	72.1	55.0	17.1
Equal benefits etc	21.0	34.3	13.3
More disadvantages	4.4	7.4	3.0
Many more disadvantages	1.3	2.0	0.7
Total disadvantages	5.7	9.4	3.7

4. Gender comparisons, 1987*: percentage saying technological developments have many more or more benefits than disadvantages.

Category	Men	Women	Difference
Profs, managers, owners	89.7	68.3	21.4
White collar	76.1	55.2	20.9
Semi-skilled, unskilled	59.9	37.8	22.1
Tertiary educated	87.7	70.5	17.2
5th/6th form	71.5	62.2	9.3
Some secondary	60.2	41.4	18.8
Aged 14-24	69.5	51.1	18.4
Aged 50 and over	72.2	54.6	17.6

*Some of these comparisons need to be treated cautiously because of the small sample sizes involved. The overall pattern of difference is, however, quite clear.

5. Biggest difference between categories, 1987:

Most positive: male managers -	
Many more benefits	52.1
More benefits	42.6
Total benefits	94.7
Equal benefits etc	5.4
Total disadvantages	0
Least positive: female semi- and unskilled workers -	
Many more benefits	11.8
More benefits	26.0
Total benefits	37.8
Equal benefits etc	21.3
More disadvantages	16.2
Many more disadvantages	4.8
Total disadvantages	21.0
Difference: more benefits	56.9
more disadvantages	21.0

The Commission for the Future was established by the Commonwealth Government to encourage Australians to become involved in the economic and social opportunities made possible by scientific and technological development.

The Commission's job is to explain the social impacts of science and technology and to foster the development of an innovative, productive culture.

The Commission's main purpose is to demonstrate that Australians can influence their future through informed choice.

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