SEMI CONDUCTOR CHIP PROTECTION: COPYRIGHT OR SUI GENERIS?

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I. INTRODUCTION

The developed world is entering the electronic estate[1] and one of the main causes of the revolution has been the semiconductor chip. Using photo-reduction onto minute chips of silicon, vast amounts of information can be stored and transmitted. These wafers of silicon are also known as integrated circuits and may, as microprocessors, control the functions of a device or, as memories, store information for use in computers and data bases.[2]

In recent years wide scale copying of chips has been seen as a threat to the industry and questions of appropriate legal protection have arisen. The granting of monopolies in exchange for the revelation of innovations beneficial to the community has long been the basis of intellectual property regimes in Australia and other countries. These regimes, however, have increasingly proved inadequate or inappropriate when dealing with new technologies, and this has been a recurrent theme in recent legal writings.[3] The issue has been brought to the fore most recently in Australia by the decision of the High Court in *Computer Edge Pty. Ltd.* v. *Apple Computer Inc.*.[4]

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1 T. Barr, *The Electronic Estate: New Communications Media and Australia* (1985).
2 U.S. Congress Hearings, The Semiconductor Chip Protection Act 1983: HR 1028, 2.
3 See *e.g.* C. Tapper, "Genius and Janus: Information Technology and the Law" (1985) 11 *Monash L R* 75.
4 (1986) 60 ALJR 313.

In this case it was held by majority that there was no copyright protection for computer programs embodied in chips prior to the 1984 amendments to the Copyright Act 1968 (Cth). This raises further the question of protection for computer programs embodied in a form which is outside the definition inserted into section 10 of the Act in 1984. It is not beyond argument, despite these amendments, that computer programs incorporated in silicon chips are protected from piracy by Australian law. Even if the computer program in a chip can be subject to copyright protection, Australian copyright law may not protect the design of a chip, also known as the layout or architecture.[5] A distinction is to be drawn between the layout of a chip and the computer program stored therein. Without special legislation there may be nothing to protect chip design independently of any program that the design may express. The United States has enacted the Semiconductor Chip Protection Act, 1984 to provide this additional protection for such designs.

Many daily activities are linked to the use of semiconductor chips, which are used to regulate fuel consumption in cars, room temperatures in thermostats,[6] and in cash registers to add up purchases and record inventory movement.[7] The chip has made "intelligent" buildings possible; office blocks which automatically adjust the temperature and lighting according to the rooms in use, and automatically adjusting shutters on windows according to the angle of the sun. "Electronic control of just about every device in the home"[8] is possible, and some new houses in the United States are being built to "think". Some of the possibilities for home use include control of lighting, heating, sprinkler systems and electronic appliances. It would be possible, for example, to arrange sensors to sound an alarm if an infant's breathing stopped, turn off lights when a person left a room, "or have a mixer prepare a strawberry daiquiri precisely at six every evening".[9] The scheduling of electrical events could allow savings on energy bills, if the dishwasher or water heater can be programmed to run at midnight when utility rates are lowest. Visitors could be interviewed by a computer linked to an electronic eye before being allowed in, and a random pattern of lights and radio playing would make the house seem occupied.

The chip has resulted not only in new products but also in the development of new industries. Apart from personal computers, a range of other products has emerged; hand-held calculators, video games and digital watches have been made possible by developments in chip technology, and production costs for these items have dropped while product quality and diversity has improved.

5 R. Roberts "Protection of Semi Conductor Chip Design Under Canadian Law: Will Canada Follow the Lead of the United States?" (1985) 23 *U West Ont L R* 101, 104.
6 Note 2 *supra*.
7 *Ibid.*
8 "Computers May Soon Have the Whole House on line" January 24 1986, *Business Review Weekly* 82.
9 *Ibid.*

These examples and the effects on our lives are trivial in comparison with the developments in information technology (known as "informatics" or "computications"[10]) which have been brought about by computers, word processors and telecommunications and the links that can be established between them. It is now possible for almost instantaneous exchange of information to occur on a world-wide basis. That information, because it can be stored so readily and in such quantities, has far reaching implications for privacy, international relations, national security and defence.[11] The effects of computers in industry and on employment are as yet incalculable, but they include the emergence of a different sort of workforce, members of which perform their duties in novel ways. Management packages allow computers to organise work schedules, designating projects, how long each should take, specifying personnel and resources, identifying costs, keeping control of staff numbers and preventing duplication of effort or resources.[12] Expert systems (a set of rules that a computer can apply to select alternatives and draw conclusions) allow a computer to act as a skilful consultant, producing answers requiring reasoning, searching, pattern-matching, judging of probabilities, and revising those judgments in the light of new data.[13] Micro-electronic circuits are replacing telephone exchanges resulting in a computer/telecommunications interface which has dispensed with the need for centralised operations. Industries where communications and access to information is necessary can now act in a distributed manner. One of the first examples of this was the administration of airline bookings.[14]

Another phenomenon which the chip is bringing about is the emergence of a new profession of technicians and experts not subject to traditional constraints of employment, who can work from home to obtain product, price and stock level details or communicate with colleagues via electronic mail systems, and with the company's computer system. Word processing, conferences, electronic filing and other secretarial functions are also possible from home. The blurring of the distinction between the home and work place is leading to a redefinition of work and leisure, as well as a shift in traditional rates and status of employees. This is commensurate with a blurring of lines between learning and leisure as education becomes more computer-centred and students learn to incorporate computerised modes of work and communication into their lifestyle.[15]

The emergence of the 'electronic estate' has been identified, as a "fourth sector"[16] which supplements the declining primary (agricultural), secondary (manufacturing) and tertiary (service) sectors of the economy. The impact of

10 See M. Kirby "Informatics and Law Reform" (1981) 1 *J Law & Info Science* 1,1.
11 *Id.*, 5-6.
12 J. Kavanagh "Letting Computers do the Managing" September 20 1985, *Business Review Weekly* 30.
13 S. Shirley "The Impact of Technology on Work" January/February 1985 *BACIE Journal* 14.
14 *Id.*, 14.
15 *Id.*, 15.
16 Note 10 *supra.*, 3.

this 'fourth estate', said to be the fastest growing in the developed world[17] has been explored by reports in several countries including Australia.[18]

II. PROBLEMS OF CHIP PIRACY

The combination of rapid technical advances and wider dissemination of computers through the community has been achieved by miniaturistation, or micro-technology resulting in the storage of almost unimaginable amounts of information in silicon chips. Current legal debate concerns issues of protection of these chips, the harbingers of the 'fourth sector'. Such issues concern not only the mode of protection, but also the desirability of such protection being introduced at all. The silicon chip or semiconductor industry is extremely important to the United States economy[19] and is becoming more important to Australia as advances are made in the indigenous industry. It has been estimated that the research and development cost of a single complete semiconductor chip is approximately US$ 4 million, without the marketing costs involved in selling a chip and associated programs.[20] A pirate may copy a chip photographically for about US$ 100,000,[21] moving straight into a developed market. This piracy has been regarded as a disincentive to the production of new chips,[22] although for a decade the industry grew rapidly as firms competed on the basis of product innovation, rather than pricing practices or market strength.[23] Recently, however, profits have become smaller and expenses higher, with the research and development costs sometimes not being recouped by the first producer. One of the most important factors in this has been the activities of state-assisted Japanese companies in gaining control of the semiconductor chip market through production and pricing strategies, rather than innovation. These days, within six or nine months of the introduction of a new product the Japanese produce a copy and cut the price so that chip-makers cannot recoup costs.[24] The "continued weakening of the worldwide semiconductor market"[25] has led to the loss of jobs from the work force of the semiconductor units of companies which do not have sufficient volume of orders for the chips they develop. It is accepted that the marketing and production practices of competitors have caused these problems in the industry. The International Trade Commission

17 *Id*, 3.
18 Committee of Inquiry into Technological Change in Australia, *Technological Change in Australia*, Canberra, 1980.
19 The semiconductor and computer industries are predicted to be the two fastest growing US manufacturing industries in 1986. M. Betts "Computer & Chip Industries Tipped to Lead U.S. Growth", January 7 1986 *Computer World* 17.
20 R. Giller, "ROMS, RAMS and Copyright: The Copyrightability of Computer Chips" (1984) 14 *Sw U L Rev* 685, 686.
21 *Ibid.*
22 *Ibid.*
23 J. Chesser "Semiconductor Chip Protection: Changing Roles for Copyright and Competition" (1985) 71 *Va L Rev* 249, 253.
24 For an explanation of the competitive advantages which the Japanese exploit, see *Id*, 268.
25 "Texas Instruments to cut workforce by 2000", *Computerworld*, January 4 1986, 27.

in recent proceedings unanimously ruled that the US semiconductor industry had suffered from the predatory pricing practices of Japanese chip-makers.[26] In that particular instance Hitachi Ltd. issued instructions to its sales force to undercut US prices by 10%, resulting in an estimated loss to the American semiconductor industry of US $53 million in the first quarter of 1985.[27] Dumping of chips by Japanese firms has led to the imposition of duty on Japanese chips by the US Commerce Department following the virtual withdrawal from certain sectors of the chip market by American firms. Following this concession of the market, the Japanese company NEC announced a 20% price increase on the chips in question.[28] Japan's Ministry of International Trade and Industry (MITI) has been described as "herding Japanese firms into an all-out, near-Kamikaze attack on the semi-conductor industry",[29] "looting at the scene of a disaster."[30] MITI has apparently now turned its attention to the raw material of the chip, the wafers of high quality polysilicon upon which the circuits are etched.[31]

Other factors have threatened innovation in the semiconductor chip market, including the over-exploitation of resources and saturation of the market with competitors, which reduces profit margins used to finance increasing research and development costs.[32]

The issue of legal protection for semiconductor chips has come to the fore since preeminence based on innovation alone has been lost, so that being first in the market with a new product no longer ensures an adequate return on investment costs. In America, the Semiconductor Chip Protection Act 1984 has been passed to offer legal protection for new integrated circuit designs. This Act aims to provide sui generis protection independent of existing intellectual property statutes. This Act will be discussed below, in the context of Australian law with regard to protection of integrated circuits.

III. WHAT IS A SILICON CHIP?

Silicon chips may store computer programs,[33] but more commonly embody circuits which can perform logic functions using digital switching techniques involving storage and gating functions by way of many transistors, or by using electronic and optical techniques, so-called analogue functions of

26 "ITC rules on chip dumping". *Computerworld* November 22 1985, 39.
27 *Ibid.*
28 C. Wilder, "Japan 'dumping chips'", *Computerworld*, December 20 1985, 26. The chips in question were 64K-byte and 256K-byte dynamic Ram chips.
29 "Japanese Eye the Silicon Wafer" *Business Review Weekly*, August 30 1985, 52.
30 "'Looters' hit US microchip industry" *Pacific Computer Weekly*, October 18 1985, 7.
31 Note 28 *supra.*
32 Note 23 *supra*, 267, 269.
33 The description of computer programs and their incorporation in silicon chips is derived from Giller, note 20 *supra*, 689 and the judgment of Mr Justice Fox in the Federal Court in *Apple Computer Inc.* v. *Computer Edge Pty. Ltd.* (1984) ALR 225. See also J. McKeough "Case Note: *Apple Computer Inc.* v. *Computer Edge Pty. Ltd.*" (1984) 7 *UNSWLJ* 161.

amplification and modulation can occur.[34] If these integrated circuits do not embody a computer program but only perform electronic and related functions, there is no question of copyright protection as a literary work. Some of the functions that can be performed by integrated circuits have been described in the introduction.

If a program is embodied in a chip, it usually occurs in this way: Once a problem to be resolved is identified, a computer programmer constructs an algorithm to provide a solution to the problem and then sets about translating the information into instructions for a computer to perform specified tasks. The programmer first puts the information into source code (high level computer language). The source code is translated into a lower level computer language (assembly language) and ultimately into object code (machine language), which consists of nothing more than a string of ones and naughts. It is this binary system of communication which is understood by most computers, and which operates switches inside the computer to perform the underlying algorithm, achieving the desired result. Object code may be stored on silicon chips which are known as read-only memory chips (ROMs). There may be some scope for alteration or programming of information stored on such chips[35] however, and these chips are known as programmable read only memory (PROMs) or erasable programmable read only memory (EPROMs). The instructions stored in object code on these chips must be disseminated and acted upon. The central processing unit (CPU)[36] of a computer receives the information from the memory device and performs the computer's mathematical and logical operations. A CPU in a personal computer is usually a single integrated circuit, about the size of a postage stamp.[37]

The object code stored on a silicon chip is in the form of an integrated circuit layout, which is a representation of the underlying computer program[38] (originally written in source code). Once the actual layout of the circuit is designed, a glass or chrome plate with the layout printed onto it is produced. This is known as a mask, which is then photoreduced into a smaller working mask[39] and printed onto the final chip. The chip itself is a wafer of silicon which is polished and chemically treated to receive the imprint of the circuit from the working mask. Several layouts may be imprinted onto a chip which then interact to produce the desired results. New processes for producing chips are being developed which eliminate the

34 R. Hart "Legal Protection of Semiconductor Chips in the U.K." [1986] *Int.l Rev Computers Tech & L* 83.

35 For further details of varieties of ROMS and RAMS see Giller, note 20 *supra*, 691. Note that their functions are not entirely interchangeable since information stored on a RAM will be erased when the power to the computer is turned off.

36 See Mr Justice Fox in *Apple* note 33 *supra*, for a description of the functions of the CPU.

37 Note 20 *supra*, 690.

38 *Id.*, 694.

39 Oxman, "Intellectual Property Protection and Integrated Circuit Masks", (1980) 20 *Jurimetrics J* 405, 408, cited in Giller, note 20 *supra* 694.

making of a mask by having information written directly onto the chip by a laser. The information used to control the laser beam is referred to as a mask, as is the conventional physical photographic-type mask.[40]

IV. AVENUES OF PROTECTION: LITERARY OR ARTISTIC WORKS?

The technology for copying chips is well developed and relatively inexpensive compared with research, development and manufacturing costs.[41] In November 1985 a meeting of the World Intellectual Property Organization's Committee of Experts on Intellectual Property in respect of integrated circuits took place. A report was produced which expressed the desirability of an international system for the protection of integrated circuits, based on the principle of national treatment, with common ground set out in a Draft Treaty. The discussions were beset with problems of definition of key terms, identification of the object and scope of protection, and the problem of interaction with national laws.[42] The Australian delegation expressed support for the view that a flexible approach should be maintained to integrated circuit protection rather than requiring strict uniformity and reciprocity between members, particularly since Australian copyright law was said to already protect integrated circuit designs and it would be a matter of concern if Australia were required to make exceptions to its general law in order to become party to the Treaty.[43] In fact, it is submitted that there may be protection for computer programs expressed in semiconductor chips, but not for the design as such.

Since the need for integrated circuit protection is well recognised, the issues in Australia centre around how far integrated circuits (silicon chips) are in fact protected. This question first arose in 1983 at the trial of the now famous *Apple Case*[44] where the plaintiff manufacturers of Apple computers claimed copyright protection for three silicon chips copied and used in the defendant's Wombat computer. The basis of the protection claimed was that the chips embodied literary works within the meaning of the Copyright Act. This was rejected by Beaumont J., however on appeal to the Full Federal Court[45] (Fox, Lockhart and Sheppard JJ.) it was unanimously held that the source programs were original literary works, and by majority (Sheppard J. dissenting) that the object code in the Apple ROMs was an adaptation of source code within section 31(1)(a)(vi) of the Copyright Act, which confers

40 Note 34 *Supra*, 84.
41 For a description of this process see Hart, *id.*, 85.
42 Report Adopted by the Committee of Experts on Intellectual Property in respect of Integrated Circuits, WIPO, November 29 1985, 11.
43 *Id.*, 5.
44 *Apple Computer Inc.* v. *Computer Edge Pty Ltd* [1983] ATPR 40-421.
45 (1984) 53 ALR 225.

copyright in an adaptation of a literary work.[46] The High Court (Gibbs C.J., Mason, Brennan, Wilson and Deane JJ.) restored the decision of the trial judge, all of the judges except Deane J. (who did not decide this point) agreeing that a program in source code amounted to a literary work, but the majority (Gibbs C.J., Brennan and Deane JJ.) did not think that the object code embodied in the chips were works within the Act, nor were they shown to have been adaptations or reproductions of the Apple source programs. In his judgment Gibbs C.J. said:

> The question that then arises is whether the Applesoft and Autostart object programmes embodied in the ROMs were literary works. As has been shown, those programmes existed in the form of a sequence of electrical impulses, or possibly in the pattern of circuits that when activated generated those electrical impulses. On any view they were not expressed in writing or print. Although the electrical impulses could be represented by words or figures, the impulses themselves did not represent or reproduce any words and figures. They were not visible or otherwise perceptible, and they were not, and were not intended to be, capable by themselves of conveying a meaning which could be understood by human beings. Obviously, the patterns of the circuits in the ROMs also did not represent or reproduce any words or figures, and were incapable of conveying any meaning. It is true that the object programmes might have been printed out in binary or hexadecimal form, but the question whether any such written expression of the programmes would have been a literary work is not the question that now falls for decision. We are concerned with the object programmes embodied in the ROMs and it seems clearly to follow from the cases already cited, which decide that a literary work is a work expressed in print or writing, that they were not literary works...
>
> It seems to me a complete distortion of meaning to describe electrical impulses in a silicon chip, which cannot be perceived by the senses and are not intended to convey any message to a human being and which do not represent words, letters, figures or symbols as a literary work; still less can a pattern of circuits be so described.[47]

It was further argued for the respondents (Apple) that the object programs were adaptations of source programs. Section 10(1) of the Copyright Act at the relevant time defined "adaptation" thus:

> (a) in relation to a literary work in a non-dramatic form — a version of the work (whether in its original language or in a different language) in a dramatic form;
>
> (b) in relation to a literary work in a dramatic form — a version of the work (whether in its original language or in a different language) in a non-dramatic form;
>
> (c) in relation to a literary work (whether in a non-dramatic form or in a dramatic form) —
>
> (i) a translation of the work; or
>
> (ii) a version of the work in which a story or action is conveyed solely or principally by means of pictures; and
>
> (d) in relation to a musical work — an arrangement or transcription of the work.

The respondents argued that the embodiment of the object program in the silicon chip was a translation of the source programs, and therefore an

46 The previous decisions in the *Apple Case* have been discussed at length elsewhere. For an explanation of the basis of copyright protection and the application of the Copyright Act 1968 before the 1984 amendments, see McKeough, "Case Note: *Apple Computer Inc.* v. *Computer Edge Pty. Ltd.*" (1984) 7 *UNSWLJ* 97; Liberman, "The Apple Cases: A Comparison of the American and Australian Cases" (1984) 7 *UNSWLJ* 143.

47 Note 4 *supra*., 316.

adaptation within section 10(1)(c)(i). Gibbs C.J. interpreted translation to have its "primary" meaning (from the *Shorter Oxford English Dictionary*) as being "the action or process of turning from one language into another". The "transferred" or "figurative" meaning of translation from the dictionary as "The expression or rendering of something in another medium or form" could not apply, since that figurative translation is confined by paras (a), (b) and (c)(ii) of the definition in s.10(1). His Honour continued:

> Clearly the programmes in the ROMs were not a translation of the source programmes within the primary meaning of the word because when the programmes were embodied in the ROMs they were not turned into another language, even into another computer language — they were turned into electrical impulses. If it be assumed, contrary to my opinion, that translation in the definition is used also in its transferred and figurative sense, I consider that the object programmes in the ROMs were not a translation of the source programmes within that usage of the expression. When the dictionary definition refers to 'the expression or rendering of something in another medium or form' it must refer to the portrayal, utterance, representation, reproduction or depiction of the thing in a different medium or form. The ROMs did not in any way express or render the source programmes; rather, the ROMs were the means of putting into action and making effective the instructions written in the source programmes. Just as a person does not (except in a metaphorical sense) translate the instructions for the working of a machine when, following those instructions, he sets the machine in motion, so the electrical charges in the ROMs effectuate, but do not translate, the instructions in the source programme.[48]

Brennan and Deane JJ. agreed with this view of object code as embodied in a silicon chip, Mason and Wilson JJ. in a joint judgment dissented on this as in their opinion object code may be an adaptation of source code, which is a literary work. Furthermore, although the Copyright Act may require an adaptation to be a literary work itself, the concept of "literary work" should not be too closely confined:

> Section 31(1)(a)(vii) provides that copyright, in relation to a literary work, is the exclusive right, inter alia, to reproduce in a material form a work that is an adaptation of that literary work. 'Work' is defined in s.10(1), unless the contrary intention appears, to mean inter alia a literary work. Prima facie, therefore, an adaptation of a literary work must itself satisfy the description of a literary work. Of course, one would expect that an adaptation, in this case a translation of the original literary work constituted by the source codes, would continue to display, in its new form, the characteristics which enabled the original work to satisfy that description. But it is argued for the appellants that that is not so in the present case because a literary work must be in writing. Ordinarily and traditionally it is no doubt true that a literary work would take a written form. But the Act does not require it to be so. Indeed, s.22(1) of the Act identifies the time when a work is made as the time when '*the work was first reduced to writing or to some other material form*' (our italics). See also s.21 of the Act. There seems to be no reason to doubt that a literary work is made and entitled to copyright protection from the time it is first recorded on tape, if that be the first material form that the work takes. In our opinion, an object code, although brought into existence by mechanical means, takes on the same literary character as is possessed by the source code from which it is derived.[49]

The majority judgments reflect the preoccupation of the law of copyright

48 *Ibid.*
49 *Id.*, 321.

with the distinction between ideas and their expression. This is reflected in the requirement that, in order to gain copyright protection, the subject matter must be in a material form.[50] The majority were unwilling to extend copyright protection to a set of electrical impulses, nor could these electrical impulses be said to reproduce for copyright purposes the Apple source code, as

> it is impossible to say that there is any objective similarity between the ROMs and EPROM on the one hand and the written source programmes on the other. Neither the silicon chips nor the electrical impulses have the slightest resemblance to the written source programmes.[51]

While the Wombat chips may have reproduced the Apple chips, thus giving expression to the same idea, this copying was not impugned by the existing copyright legislation, since the chips themselves did not embody a work capable of protection (and, could not be identified as reproductions of a literary work in source code). Mr Justice Brennan said:

> The chief difficulty in the way of Apple's claim that the making of the Wombat ROMs and EPROM 'reproduced' the Applesoft and Autostart source programmes lies in the want of resemblance between the written source programmes and the Wombat ROMs and EPROM. Perceiving this difficulty, counsel for Apple sought to identify the literary work in which Apple's copyright subsists not as the written compilation but as that collocation of ideas expressed in the written compilation. If the collocation of ideas be the work in which copyright subsists, so the argument runs, the expression of that collocation of ideas in any material form constitutes a reproduction of the original work: it is immaterial whether the form in which the collocation of ideas is originally expressed resembles the form in which they are expressed by the copyist. The argument runs counter to a formidable body of authority.[52]

As a direct result of the Apple decision at trial, amendments were made to the Copyright Act aimed to ensure that computer programs embodied in software and firmware would be protected. These amendments followed intense public debate[53] and were perceived as being possibly short term or 'sunset' provisions, with different or more adequate statutory protection being drafted at a later stage. The four amendments may be summarised as follows:

1) A "literary work" is now partially defined in section 10(1):

> 'literary work' includes —
>
> (a) a table, or compilation, expressed in words, figures or symbols (whether or not in a visible form); and
>
> (b) a computer program or compilation of computer programs;

2) A "computer program" in section 10(1) means:

> an expressing in any language, code or notation, of a set of instructions (whether with or without related information) intended, either directly or after either or both of the following:
>
> (a) conversion to another language, code or notation;

50 The Act does not expressly require this, but protection is only given to the (original) expression of ideas, not the idea itself. See Ricketson, *The Law of Intellectual Property* 1984; Blakeney & McKeough *Intellectual Property: Cases and Materials* 1986 Ch.2.

51 *Computer Edge P/L* v. *Apple Computer Inc.* (1986) 60 ALJR 313, Gibbs CJ at 317.

52 *Id.*, 327.

53 See *National Symposium on Legal Protection of Computer Software*, Canberra, 15-16 March, 1984.

(b) reproduction in a different material form, to cause a device having digital information processing capabilities to perform a particular function.

3) "Adaptation" in section 10(1) now has a new sub-paragraph:
(ba) in relation to a literary work being a computer program — a version of the work (whether or not in the language, code or notation in which the work was originally expressed) not being a reproduction of the work.

4) "material form" is defined to mean any form of storage, visible or not, from which the work or adaptation can be reproduced.

It has been pointed out that the definition of computer program is not all inclusive. For example it omits any reference to statements and may therefore not apply to data specifications in programs. It is also limited to digital devices, and hence would not apply to programs for analogue computers. Nor is it clear that it will be capable of applying to programming for the coming generation of optically based machines. It is also possible to argue that the words "language, code or notation" are not sufficiently general to encompass patterns of electrical impulses, and would thus exclude object code from being in itself a computer program.[54]

If object code is not itself a computer program, then such a program in a silicon chip may not be protected by the Copyright Act for the reason given by the majority of the High Court; that it may not be possible to perceive that the chip contains a reproduction of the source code. The amended definition of material form does not assist the argument that a ROM is a reproduction of the source program in a material form because despite the fact that the reproduction need not be visible, all three majority judges in the High Court decided that object code simply was not a reproduction.

The ROM may not contain an adaptation of source code either, if the new definition in section 10(1)(ba) is not construed to include patterns of electrical charge. Tapper comments: "Of course, if notation is given a wide meaning such difficulty will be avoided, but it would have been more helpful if legislation designed to clarify the position had been a little more explicit".[55] Furthermore, even if object code is an adaptation of source code due to the amendment, Gibbs C.J.[56] and Brennan J.[57] both required the adaptation itself to be a literary work. On these judgments object code in a chip is in no better position under the amendment than before. These two judges also referred to the implicit assumption in the Copyright Act that a literary work will be in writing, or at least in some visible form which conveys meaning to the reader.[58] Even now, the amendments do not positively state that a literary work in the form of a computer program may be invisible.[59] Brennan J. did

54 C. Tapper, "Genius and Janus: Information Technology and the Law" (1985) 11 *Monash L Rev* 75, 94.
55 *Ibid.*
56 *Apple* note 4 *supra.*, 317.
57 *Id.*, 327.
58 *Id.*, 316 per Gibbs C.J.; 325 per Brennan J.
59 See S. Low "Copyright Law — Even High Court Judges Disagree" *Computerworld*, June 13 1986, 6.

not wish to divorce the meaning of "language" from human speech, "a means of communicating ideas which does not consist of words is not properly to be described as language".[60] This attitude towards confining copyright law to its traditional scope was echoed by Gibbs C.J. who said that "...although it would no doubt be right to give the Copyright Act a liberal interpretation, it would not be justifiable to depart altogether from its language and principles in an attempt to protect the products of scientific and technological developments which were not contemplated, or only incompletely understood, when the statute was enacted".[61]

This line was more seriously pursued by Deane J., whose reasoning with regard to the application of copyright to silicon chips is unaffected by the amendments. Deane J. thought that since a ROM is a functional article made in accordance with a set of instructions, (the source program) which may or may not be a literary work itself there would be no infringement of copyright. Just as persons making a rabbit pie in accordance with the instructions in *Mrs Beeton's Cookery Book* do not infringe literary copyright in that book[62] Deane J. was of the opinion that protection for new technologies, if any, should not be derived from distorting existing intellectual property regimes to accommodate some notion of "fairness".

Similar sentiments on the role of copyright protection have been expressed (albeit in a different context) in an interesting case handed down in February 1986, *British Motor Corp.* v. *Armstrong Patents Co. Ltd.*[63] The House of Lords decided that indirect copying of a functional article (a car exhaust system) was not impugned by copyright. The basis of the majority decision was the implied right of car owners to repair their cars in the most economical way possible, unrestricted by monopoly. This was not necessarily based on an implied licence to repair, but also non-derogation from grant.[64] The majority made little effort to hide the opinion that "the exploitation of copyright law has gone far enough"[65] and the use of it to protect monopolies in the sale of functional items of commerce was inappropriate. The decision has led one commentator to state that the House of Lords has

> opened up an avenue of startling legal innovation in the BL spare parts case which the dissenting Law Lord described as 'this untrodden path'. He was referring to the consumer's hitherto unknown right to repair his durables economically.[66]

This approach would tend to suggest that there would be no protection for silicon chips even if classified as reproductions of an artistic work, which has been suggested as a possible mode of protection.[67] The "artistic work" could be either the mask work or, at an earlier stage, the circuit diagram. Section 10

60 Brennan J., 325.
61 Gibbs C.J., 318.
62 Deane J., 329, quoting from *Cuisenaire* v. *Reed* [1963] VR 719, 736 per Pape J.
63 [1986] FSR 221.
64 *Id.*, 257 Lord Templeman.
65 *Id.*, 258 Lord Templeman.
66 Hampton, "Difficult Appeal Cases tend to make poor law", *Financial Times*, Thursday May 8 1986, 43.
67 Note 33 *supra*, 89.

of the Copyright Act defines an artistic work as including a drawing and a drawing as including a diagram, map, chart or plan. Alternatively, a circuit may be regarded as a photograph or engraving. Copyright protection may be available for a reproduction of an artistic work in another dimension,[68] if the relation between the work and the object is apparent to a non-expert.[69] This line has not been pursued in Australia, and even so, the operation of the Copyright Act section 77 may well deprive such an item of copyright protection, since something capable of being registered as an industrial design will not have copyright protection.

For the possibility of design protection to exist, however, the design must be capable of being judged by the eye,[70] but is not excluded from registration simply because it possesses functional attributes.[71] If, however, a chip or mask work did not fulfil the criteria for registrability,[72] and can be considered an artistic work for copyright purposes, this does not necessarily mean that copyright protection will be available due to the operation of the Copyright Act, section 71. It is uncertain whether a non-expert would be able to see the link between the (two dimensional) mask work and the design of the chip itself, (as a three dimensional item) since the chip is made up of layers of silicon each with a layout imprinted or deposited. The layouts are, of course, much smaller than may be perceived by the human eye.

The question of similarity between the work and its corresponding reproduction in another dimension is essentially a question of fact, as the High Court emphasised in *S.W. Hart & Co Pty Ltd* v. *Edwards Hot Water Systems*.[73] Although the non-expert may be assisted in this comparison by instructions or writing on the two dimensional artistic work, "the test is one of appearance; it involves a visual comparison between the drawings and the alleged infringing object".[74] A "visual comparison" test, presupposes a comparison between items which are in fact visible. Furthermore, extrapolating from the reluctance of Brennan J. in *Apple* to expand the meaning of language (in which a literary work is expressed) beyond the confines of human speech, it can be argued that the definition of artistic work will be confined by the need for the work or copy to be perceived by the human eye. This is particularly likely in view of the policy behind section 71 of the Copyright Act, which was adverted to by the House of Lords in the *Armstrong Patents Case*.[75] In discussing the equivalent section, 9(8), of the Copyright Act 1956 (UK) Lord Templeman (at 249-50) and Lord Griffiths

68 S.21(1) Copyright Act 1968 (Cth).
69 S.71 Copyright Act 1968 (Cth).
70 *Edwards Hot Water Systems* v. *S. W. Hart & Co. Pty. Ltd.* (1983) 49 ALR 605.
71 Designs Act 1906 (Cth) s.18.
72 See M. Blakeney & J. McKeough, *Industrial and Intellectual Property: Cases and Materials* 1986 Ch.3 and authorities cited therein.
73 (1985) 5 IPR 13.
74 *Mainbridge Industries Pty. Ltd & Sykes* v. *Whitewood & F.M. Ibbett Pty. Ltd.* (1986) 6 IPR 239, 246 per Bowen C.J., Lockhart and Wilcox JJ.
75 Note 63 *supra*.

(at 267) referred to the stated aim of the section as being to prevent copyright spreading too far into the industrial field, to subject matter far beyond the main or original scope of copyright legislation, and properly to be covered by other forms of protections, if at all.[76] Lord Griffiths specifically included "complex circuit diagrams" as being within the ambit of the section, which would remove from copyright protection any such application of an artistic work. In the event, section 9(8) did not exclude the owner of copyright in "a simple drawing of a simple object"[77] (here, the car exhaust system) from being awarded damages and injunction for breach of copyright. The comments in the High Court by Gibbs C.J., Brennan and Deane JJ., and the House of Lords decision in the *Armstrong Patents Case* exhibit a reluctance on the part of the highest courts in our legal system to extend existing copyright law beyond the limits intended by Parliament.

The inadequacy of existing legislation (possibly even after amendment) and the reluctance of judges to distort copyright law to cater for technological development raises the question of enacting some sort of sui generis legislation designed specifically to protect silicon chips from piracy. This course of action has been adopted in the United States, where the Semiconductor Chip Protection Act 1984 provides chip protection independent of the existing copyright statute. The Act provides for a ten year term of protection from unauthorised reproduction, importation, or distribution of an original mask work, defined as "a series of related images...representing the...pattern of material on a semiconductor chip".[78] The test of infringement is one of "substantial similarity" between semiconductor chips. The similarity probably has to be greater than that required to raise the inference of copying in copyright, and there is no infringement if the similarity results from functional requirements.[79] Enforcement procedures and remedies are modelled on those of traditional copyright law, and include restraining orders, injunctions, impounding and statutory orders, damages, account of profits and costs.[80] The passage of this Act created the first substantive new type of intellectual property in the United States for over 100 years, as well as being the first legislation directed specifically to a new technology. The Act does, however, draw on aspects of copyright and patent law, as well as introducing new elements.

The first attempts to pass such legislation foundered because of disagreement as to the form and extent of appropriate protection, with some arguing that there should be no protection at all since competition in the

76 *Report of the Copyright Committee (1952)* Cmnd. 8662 para.258 (The Gregory Committee).

77 [1986] FSR 221, 253 per Lord Templeman.

78 For commentary on the Semiconductor Chip Protection Act 1984 (U.S.) see J. Chesser, R. Roberts, "Protection of Semiconductor Chip Design Under Canadian Copyright Law: Will Canada Follow the Lead of the United States?" (1985) 23 *U West Ont L* 101; R. Stern, "Brief Analysis of the Semiconductor Chip Protection Act 1984" [1984] 10 EIPR 291.

79 Stern, *Id.*, 292.

80 Note 23 *supra*, 284.

industry provided the impetus which made America the world's leader in chip innovation. The Act has attempted to accommodate these different points of view. The chip monopoly is limited in several ways, perhaps most significantly in the Act's recognition of reverse engineering, analogous to the doctrine of "fair use". This allows the exchange of new information in the industry in that reverse engineering is permissible for the purpose of teaching, analyzing, or evaluating the concepts or techniques embodied in the mask work. The information thus gained can be used in new designs, but not to replicate the original chip.[81] Chips must be "original", that is, not consist of "staple familiar or commonplace designs"[82] before protection will be given under the Act. The scope of this requirement of originality is not clear. The Act provides for a transition period during which the new law would become effective. Full protection is given to all products first commercially exploited in the United States after the enactment of the Act in November 1984. Chips manufactured before that date but after July 1983 can be imported and distributed if a reasonable royalty is paid to the mask work owner by distributors or importers of chips which would, by virtue of the Act, infringe such mask works.[83]

One practical effect of this tailor made chip protection which takes semiconductors outside the ambit of copyright legislation, is that there is no obligation under the Universal Copyright Convention 1952 to grant equivalent protection to foreign chips under the doctrine of national treatment. Congress was concerned that amendments to the Copyright Act would, under the Universal Copyright Convention or other treaties, mean that foreign chips were protected in the United States, but American chips would not be protected by the inadequate copyright laws in other countries. A policy of comity rather than national treatment has been included in the Act, which means that reciprocal mask work protection for US chips will be required (after a period of interim protection) if the foreign chips are to be protected by the Semiconductor Chip Protection Act.[84]

At the final reading of the Act to the Senate it was envisaged that the international comity provisions would "go far to encouraging a prompt and positive response in Japan, Western Europe and elsewhere".[85] This comment seems to have been accurate in that Japan[86] has introduced legislation aimed at establishing comity with the United States, and the European Commission has drafted a Directive on the protection of

81 *Id.*, 285.
82 *Id.*, 235.
83 Stern, note 78 *supra*, 292.
84 Roberts, note 78 *supra*, 107.
85 *Id.*, 108, quoting 130 Congress Record No. 129, Part II (October 3, 1984) (Remarks of Senator Mathias).
86 A Bill for "An Act Concerning the Layout of a Semiconductor Integrated Circuit" see Hart, note 34 *supra*, 83.

semi-conductor chips in response to the requirement of reciprocity.[87] WIPO has also had discussions on a Draft Treaty for the Protection of Integrated Circuits.[88]

As to "elsewhere", no such moves have been made in Australia or Canada, nor has the United Kingdom responded to this invitation. Already in these jurisdictions some protection for computer programs exists (perhaps *attempted* protection would be more accurate in the case of Australia) under existing copyright law.[89] As noted earlier, Australia has expressed a preference for a multi-lateral approach rather than the principle of reciprocity.[90] The Semiconductor Chip Protection Act 1984 (US) has been criticised as "copyright protection masquerading as sui generis law":[91] This, it is alleged, may eventually distort copyright law. "If chip protection is indeed necessary, it should thus come from a well constructed and unique statutory vehicle: true sui generis law".[92] Similar reservations have been expressed with regard to the protection of chips under Canadian law, and attention drawn to the indications that Canada is set "upon a different course than the United States with respect to protecting semiconductor technology".[93] This accords with the sentiments of the Australian High Court in the *Apple* case (decided, albeit, on legislation in force prior to the 1984 amendments). One result of providing reciprocal chip protection with the United States for a nation producing few or no chips would be a net export of royalties, and possibly the curtailing of growth in developing indigenous industries.

It remains to be seen whether semiconductor chips and object codes therein are protected by virtue of the 1984 amendments to the Copyright Act. If so, (and the consensus of industry opinion appears to be that this is desirable)[94] then Australia will have what is possibly the most comprehensive protection for computer programs embodied in integrated circuits under copyright law of any country in the world.[95] It may be time to abandon the time honoured view of copyright as providing protection for cultural expression, and admit that, despite the views of the majority of the High Court in *Apple* and the House of Lords in *Armstrong Patents*, utilitarian items of commerce are the proper subject matter of copyright protection.

87 [1985] 11 EIPR 331.
88 November 1985, Committee of Experts. See text at note 43.
89 See R. Hart, note 34 *supra*, (U.K.); Roberts, note 78 *supra*; G. Karnell "Copyright in Computer Programs — An International Survey" [1985] 5 EIPR 126.
90 See note 43 *supra*.
91 Note 23 *supra*., 286.
92 *Id*., 287.
93 Roberts, note 78 *supra*., 108.
94 See statements from Computer Industry Representatives in *National Symposium on Legal Protection of Computer Software* (Canberra, March 1984); S. Ireland, "'Apple Turnover' Case Left Loose Ends", *Computerworld* June 13 1986, 6.
95 Compare the protection given in other jurisdictions described in Karnell, note 89 *supra*.