

Business Method Patents and Beyond: Why $E=mc^2$ is inherently patentable (at least in the U.S. and Australia)

Andrew Christie*

1. INTRODUCTION

It is a truism of patent law throughout the world that abstract concepts such as “the laws of nature, physical phenomena and abstract ideas” are not inherently patentable.¹ The classic example of such inherently unpatentable subject matter is the Einstein equation, which shows the relationship between the energy content of a body and its mass: $E=mc^2$. There are numerous instances of the courts,² patent offices³ and academic commentators⁴ invoking this example of the truism. The problem with this truism is that it is not true.

To prove this assertion, the author will use the classic example of the Einstein equation, and show that this subject matter is indeed inherently patentable according to the practice of the patent offices and the decisions of the courts in the United States and Australia. This will be done by considering how the inherent patentability requirement has been interpreted and applied in relation to various types of abstract subject matter. Particular reference will be made to the practice of the Patent Offices in the United States and Australia, and to the decisions of the courts in those countries, in relation to computer programs, mathematical algorithms and business methods. As a result of this analysis, it will be seen that the requirement of inherent patentability in those two jurisdictions has been interpreted and applied to abstract subject matter in such a way as to render the requirement meaningless in practice.

The high profile decision of the U.S. Court of Appeals for the Federal Circuit on the patentability of business methods, *State Street Bank v Signature Financial Group*,⁵ is merely the latest instalment in a history of decisions under U.S. and Australian law on the application of the inherent patentability requirement to abstract subject matter. That case held that there is in fact no exception of business methods from patentability, and that business methods are patentable in the U.S. so long as the other requirements for patentability are satisfied. When the reasoning of the court in *State Street* is viewed in the context of the previously developed law in the U.S. and Australia on the inherent patentability of computer programs and mathematical algorithms, it can be concluded that even the most abstract of concepts, including the equation $E=mc^2$, is inherently patentable in those two jurisdictions.

2. LEGISLATIVE PROVISIONS ON INHERENTLY PATENTABLE SUBJECT MATTER

“Inherent patentability” is the characteristic that all subject matter must exhibit to be potentially entitled to protection under patent law. It is a requirement in addition to the main patentability requirements of novelty, non-obviousness (or inventive step) and utility (or industrial application). Inherent patentability is, therefore, the *threshold* requirement of patentability. No matter how new, non-obvious and useful subject matter may be, it cannot be patented unless it is within that category of subject matter to which the patent system extends protection; that is, unless it is inherently patentable.

2.1 TRIPS Agreement, and the EPC

* Visiting Professor and Fulbright Senior Scholar, Duke University School of Law; and Associate Professor, Law School, University of Melbourne.

¹ See, for example, the U.S. Supreme Court in *Diamond v Chakrabarty* 447 US 303, 309 (1980).

² $E=mc^2$ has been invoked as a typical example of inherently unpatentable subject matter by the U.S. Supreme Court in *Diamond v Chakrabarty* 447 US 303, 309 (1980).

³ See, for example, the U.S. Patent and Trademark Office *Manual of Patent Examining Procedure* (Revision 1, Feb. 2000), para 2106(IV)(B)(1).

⁴ The author has on file more than 25 articles, published in the last 15 years in the U.S. alone, in which there appears, with approval, the statement that Einstein could not patent the formula $E=mc^2$.

⁵ *State Street Bank v Signature Financial Group* 149 F.3d 1368 (Fed. Cir. 1998).

Article 27(1) of the *Agreement on Trade-Related Aspects of Intellectual Property Rights* ("TRIPS Agreement")⁶ states that "patents shall be available for any inventions, whether products or processes, in all fields of technology", and then adds the proviso that they are new, involve an inventive step (or are non-obvious), and are capable of industrial application (or are useful).⁷ It is notable that the TRIPS Agreement does not define "inventions". It is implicit, however, that the TRIPS Agreement contemplates that "inventions" are subject matters that are new, inventive and industrially applicable in a "field of technology". Thus, it seems that the obligation imposed by TRIPS article 27 is for Members to provide patents for *technological* innovations.

It must be recalled that the TRIPS Agreement specifies Members' minimum obligations, not their maximum obligations. Thus, while the TRIPS Agreement obliges Members to provide patents for technological innovations, it does not prevent Members from providing patents for innovations that are not technological.

Like the TRIPS Agreement, the *European Patent Convention 1973* ("EPC") provides that patents shall be granted for "any inventions" which are susceptible of industrial application, which are new and which involve an inventive step.⁸ Also, like the TRIPS Agreement, the EPC does not define "inventions". It does, however, expressly provide that the following (amongst other things) are not regarded as inventions:

- discoveries and scientific theories
- mathematical methods
- schemes, rules and methods for performing mental acts, playing games or doing business, and
- programs for computers⁹

The EPC also expressly provides that such a subject matter shall be excluded from patentability only to the extent to which an application for a patent relates to such a subject matter *as such*.¹⁰

2.2 United States and Australian Patent Legislation

In contrast to the EPC, neither the U.S. patent legislation¹¹ nor the Australian patent legislation¹² contain an enumeration of unpatentable subject matter. The U.S. legislation uses a specific and exclusive (ie. "closed") definition of patentable subject matter, while the Australian legislation uses a general and inclusive (ie. "open") definition. Despite that difference in legislative approach, the law of the two countries on inherent patentability is quite similar, due to the way in which the courts have interpreted the legislation and the patent offices have applied those interpretations.

Under the U.S. patent legislation, the inherent patentability requirement is contained in 35 USC §101, which provides:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The Committee reports accompanying the introduction of this legislation inform that Congress intended inherently patentable subject matter to "include any thing under the sun that is made by man".¹³ In *Diamond v Chakrabarty*, the U.S. Supreme Court used this evidence of legislative intent to give a very broad interpretation to "manufacture" and

⁶ The TRIPS Agreement is Annex 1C to the *Agreement Establishing the World Trade Organization* 1994.

⁷ TRIPS art. 27(1). This general statement is expressly made subject to the provisions of paragraphs 2 and 3 of article 27, which permit Members to exclude specified categories of subject matter from patentability. None of these categories include abstract subject matter as defined in this paper.

⁸ EPC art. 52(1).

⁹ EPC art. 52(2).

¹⁰ EPC art. 52(3).

¹¹ The U.S. legislation is set out in *United States Code Title 35 - Patents* ("35 USC").

¹² The Australian legislation is the *Patents Act 1990* (Cth) ("APA").

¹³ S. Rep. No. 1979, 82d Cong., 2d Sess., 5 (1952).

"composition of matter".¹⁴ Nevertheless, the Supreme Court made clear that, in theory at least, the category of inherently patentable subject matter is not completely unlimited. In particular, the court stated as follows:

This is not to suggest that §101 has no limits or that it embraces every discovery. The laws of nature, physical phenomena, and abstract ideas have been held not patentable. Thus, a new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter. Likewise, Einstein could not patent his celebrated law that $E=mc^2$; nor could Newton have patented the law of gravity.

Under the Australian legislation, the inherent patentability requirement is contained in the provision stating that the subject matter of a patent must be an "invention".¹⁵ An "invention" is defined as "any manner of new manufacture the subject of letters patent and grant of privilege within section 6 of the Statute of Monopolies".¹⁶ The High Court of Australia in *National Research and Development Corporation v Commissioner of Patents*¹⁷ ("NRDC") sets out the requirement which the subject matter of any claim must satisfy so as to be a "manner of new manufacture" and so constitute an "invention" susceptible of the grant of a patent.¹⁸ That requirement is that the subject matter must be:

a mode or manner of achieving an end result which is an artificially created state of affairs of utility in the field of economic endeavour.¹⁹

The High Court stated that a "discovery" is inherently unpatentable because it "is some piece of abstract information without any suggestion of a practical application of it to a useful end".²⁰

Both the *Chakrabarty* and *NRDC* conceptualizations of the inherently patentability requirement make clear that, in theory, abstract concepts are outside the scope of the patent legislation. However, as the next section of this paper shows, the application of these conceptualisations by the patent offices and the courts in those two countries have produced a rather different result in practice.

3. THE INHERENT PATENTABILITY OF ABSTRACT SUBJECT MATTER

3.1 Computer programs

The U.S. approach to the patentability of computer programs is very liberal. According to the U.S. Patent and Trademark Office *Manual of Patent Examining Procedure* (Revision 1, Feb. 2000) ("USPTO Manual"), a computer program is inherently patentable when it is recorded or embodied on "some computer-readable medium"²¹ (eg. a computer disk). This is justified as follows: when the program is embodied on computer-readable medium, it "becomes structurally and functionally interrelated to the medium" such that "use of technology permits the function [of the

¹⁴ 447 US 303, 308-309 (1980).

¹⁵ APA s. 18(1).

¹⁶ APA schedule 1.

¹⁷ (1959) 102 CLR 252.

¹⁸ There is an additional requirement stated by the High Court in *NRDC* at (1959) 102 CLR 252, 268, to the effect that the subject matter, on the face of the specification, must *not* be "nothing but a new use of an old substance": see Brennan D. and Christie A., "Patent Claims for Analogous Uses and the Threshold Requirement of Inventiveness", (1997) 25 *Federal Law Review* 237. This "threshold inventiveness" requirement is not the focus of this paper, because the Australian courts have now accepted that conceptually this requirement is a component of the requirement of inventive step: *Bristol-Myers v Faulding* (1999) 46 IPR 553, 564 (Full Court of the Federal Court).

¹⁹ This is the interpretation of the High Court's test given by the Full Court of the Federal Court of Australia in *Ccom v Jiejing* (1994) 28 IPR 481, 514. The words of the High Court, which are to similar effect, are contained at (1959) 102 CLR 252, 277.

²⁰ (1959) 102 CLR 252, 264.

²¹ USPTO Manual, para 2106(IV)(B)(1).

program] to be realised".²² In this situation, the program is considered to be a "machine" with practical application in the technological arts, and hence to be inherently patentable.²³

The Australian approach to the patentability of computer programs is also very liberal. Computer software has been treated by the Australian courts in the manner expounded by the High Court in *NRDC* generally in relation to abstract information. The Federal Court in *International Business Machines Corporation v Commissioner of Patents*²⁴ ("*IBM*") held that a multi-step method (in this case, a mathematical algorithm which was implicitly limited to implementation using a computer program producing output on a screen) for producing a visual representation of a curve image from a set of control points which define the curve was inherently patentable subject matter. The invention belonged to the useful arts rather than the fine arts; the point of distinction being that the invention produced a commercially useful effect.²⁵ The Full Court of the Federal Court in *Ccom* was similarly liberal in its application of the inherent patentability requirement to a computer program. To be inherently patentable, it was sufficient that the claim included computer processing apparatus, because this constituted an artificially created and useful state of affairs in a field of economic endeavour.²⁶

3.2 Mathematical algorithms

The U.S. approach to mathematical algorithms has been clarified by two relatively recent decisions of the Court of Appeals for the Federal Circuit: *State Street Bank v Signature Financial Group* ("*State Street*");²⁷ and *AT&T v Excel Communications* ("*Excel*").²⁸ The court in *Excel* cited with approval²⁹ the following statement of principle expounded by the court in *State Street*:

Unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not "useful". From a practical standpoint, this means that to be patentable an algorithm must be applied in a "useful" way.³⁰

An algorithm will have been applied in a "useful" way if it is "reduced to some type of practical application" so as to produce "a concrete, tangible and useful result".³¹ Such an algorithm is, in the view of the *State Street* court, "limited to a practical application in the technological arts"³² - and thus within the category of inherently patentable subject matter. A practical application producing a concrete, tangible and useful result will be present so long as the algorithm uses a variable and produces an output which describes an entity in the real world. This is so even if that real world entity being represented is non-physical - such as, for example, dollar amounts.³³

The Australian Patent Office ("APO"), according to its *Manual of Practice and Procedure, Volume 2 - National* ("APO Manual"), interprets the *IBM* and *Ccom* cases as providing that a mathematical algorithm is inherently patentable so long as it "has been implemented" in some manner.³⁴ One manner of implementation which makes the claimed subject matter inherently patentable is executable computer code.³⁵ Another manner of implementation which makes the claimed subject matter inherently patentable is an equation or formula using variables which describe "physical entities in the real world".³⁶

Thus, the APO Manual provides that the following claim is *not* inherently patentable:

²² Ibid.

²³ See *In re Alappat* 33 F.3d 1526 (Fed. Cir. 1994) (en banc); *In re Lowry* 32 F.3d 1579 (Fed. Cir. 1994); *In re Wamerdam* 33 F.3d 1354 (Fed. Cir. 1994).

²⁴ (1992) 22 IPR 417.

²⁵ Ibid, 424.

²⁶ (1994) 28 IPR 481, 514.

²⁷ *State Street Bank v Signature Financial Group* 149 F.3d 1368 (Fed. Cir. 1998).

²⁸ *AT&T v Excel Communications* 172 F.3d 1352 (Fed. Cir. 1999).

²⁹ Ibid, 1357.

³⁰ *State Street* F.3d 1368, 1373.

³¹ Ibid.

³² USPTO Manual, para 2106(IV)(B)(2)(b)(i).

³³ *State Street* 149 F.3d 1368, 1373 (Fed. Cir. 1998).

³⁴ APO Manual, para 8.2.7.4.

³⁵ Ibid para 8.2.7.3.

³⁶ Ibid para 8.2.7.6.

a method of calculating a value c , using the formula

$$c = e^x \times \sin(t)$$

where c , x and t are pure variables with no defined significance to the real world³⁷

whilst stating expressly that the following claim *is* inherently patentable:

a method of determining the length of a road (L) in metres by applying the formula:

$$L = \cos \theta \times N \times g^2$$

where θ is the gradient of the road;

N is the number of litres of fuel used by a car travelling on that road; and

g is the acceleration due to gravity³⁸

The difference between the two types of claims is simply that the latter uses variables which describe "physical entities in the real world", whereas the former does not.

3.3 Business methods, schemes and plans

The leading case on the patentability of business methods in the U.S. is *State Street*. In that case, the Court of Appeals for the Federal Circuit dealt head-on with the issue of the patentability of business methods, stating as follows:

... the [lower] court relied on the judicially-created, so-called "business method" exception to statutory subject matter. We take this opportunity to lay this ill-conceived exception to rest. Since its inception, the "business method" exception has merely represented the application of some general, but no longer applicable legal principle, perhaps arising out of the "requirement for invention" - which was eliminated by § 103. Since the 1952 Patent Act, business methods have been, and should have been, subject to the same legal requirements for patentability as applied to any other process or method.³⁹

In short, methods of doing business are patentable in the U.S. so long as the other requirements for patentability are satisfied.⁴⁰

A recent decision of the Federal Court of Australia made brief mention of the patentability of business methods. In *Welcome Real-Time SA v Catuity Inc.*,⁴¹ Heerey J found the *State Street* decision "persuasive".⁴² It thus seems likely that the law in Australia is the same as the law in the U.S. - namely, claimed subject matter is not inherently unpatentable merely because it concerns a method of doing business.

The extreme to which this approach to inherent patentability can be taken is seen in the publications of the APO describing its examination practice in relation to business method claims. The APO *Manual* asserts that:

mere schemes (including business schemes) and plans are not, *per se*, manners of manufacture, and are therefore not patentable. They are analogous to mathematical algorithms in that they do not give rise to "an artificially created state of affairs", and therefore the approach to them should be the same as for mathematical algorithms, as explained in para 8.2.7, above.⁴³

³⁷ Ibid para 8.2.7.7.

³⁸ Ibid para 8.2.7.6.

³⁹ *State Street* 149 F.3d 1368, 1375.

⁴⁰ For a more detailed consideration of the *State Street* case, see Durham "'Useful Arts' in the Information Age" (1999) *Brigham Young University Law Review* 1419; Grusd "Internet Business Methods: What Role Does and Should Patent Law Play?" (1999) 4 *Virginia Journal of Law and Technology* 9; and Keeley-Domokos "Business Models: *State Street Bank & Trust Co. v Signature Financial Group, Inc.*" (1999) 14 *Berkeley Technology Law Journal* 153.

⁴¹ [2001] FCA 445.

⁴² Ibid, para. 129. This view strictly is *obiter*, however, since Heerey J concluded that the claim in question did not involve a business method.

⁴³ APO Manual, para 8.2.8.3.

Given the approach adopted in relation to mathematical algorithms, it must follow that subject matter that is a business scheme or plan is inherently patentable when it "has been implemented" in some manner, such as by executable computer code, or by an equation or formula using variables describing entities in the real world.

The APO confirms this view in its web site publication entitled *Patents for Schemes or Plans*.⁴⁴ This document states:

Essentially a patent may be granted for a scheme or plan where there is a means for putting the scheme or plan into effect. ... On the other hand a scheme (including a business scheme) or plan, by itself, is not suitable for a patent because it does not specifically give rise to an artificially created end result of economic utility.⁴⁵

The document then proceeds to provide examples of business schemes that are not inherently patentable and business schemes that are inherently patentable. The following are two examples of schemes that are *not* inherently patentable:

- A method of raising funds by seeking sponsors to donate products, and conducting a raffle of those products.
- A method of analysing the performance of an investment by creating a benchmark, and comparing the investment to the benchmark.⁴⁶

The following are examples of schemes that *are* inherently patentable:

- A method of raising funds by seeking sponsors to donate products, *and using a random number generator* operating in a specified way to conduct a raffle of those products.
- A method of analysing business performance by *programming a computer system* to compare business performance against a specified set of parameters.⁴⁷

These examples are particularly insightful, showing clearly as they do that for a business scheme to be inherently patentable it is necessary only that a means for implementing the scheme be identified. As the *Patents for Schemes or Plans* document proceeds to state:

In the above examples the patentability of the scheme or plan resides in artificially putting the scheme or plan into effect.⁴⁸

In the examples of patentable schemes, the italicised words are a means of "artificially putting the scheme or plan into effect". As those examples show, implementation means sufficient to satisfy the inherent patentability requirement include the use of a programmed computer.

3.4 Discoveries, scientific theories and laws of nature

According to a number of Supreme Court decisions,⁴⁹ a law of nature or a natural phenomenon *per se* is excluded from patentability, but only because it "is not a practical application or use".⁵⁰ Where a claim relating to such subject matter does have a practical application, it is not excluded from patent protection. For example, a claim directed to the practical application of electromagnetic energy to overcome specific problems associated with the transmission of information by

⁴⁴ <http://www.ipaustralia.gov.au/library/PDFS/patents/schemes.pdf>

⁴⁵ Ibid.

⁴⁶ Ibid.

⁴⁷ Ibid (emphasis added).

⁴⁸ Ibid.

⁴⁹ See, for example, *Rubber-Tip Pencil Co. v Howard* 87 US (20 Wall) 498 (1874); and *Mackay Radio & Telegraph Co. v Radio Corp. of America* 306 US 86 (1939).

⁵⁰ USPTO Manual, para 2106(IV)(A).

telegraph is inherently patentable.⁵¹ As observed by Frankfurter J in the U.S. Supreme Court decision *Funk Bros. Seed Co. v Kallo Inoculant Co.*:

It only confuses the issue to introduce terms such as “the work of nature” and the “laws of nature”. For these are vague and malleable terms infected with too much ambiguity and equivocation. Everything that happens may be deemed “the work of nature” and any patentable composite exemplifies in its properties the “laws of nature”. Arguments drawn from such terms for ascertaining patentability could fairly be employed to challenge almost any patent.⁵²

The observation of Frankfurter J, cited above, has been quoted with approval by the Australian High Court in *NRDC*.⁵³ As to the traditional understanding that a mere discovery is not an invention, the High Court in *NRDC* notes:

the truth is that the distinction between discovery and invention is not precise enough to be other than misleading in this area of discussion.⁵⁴

The High Court held that, in considering whether claimed subject matter is inherently patentable, the focus should not be on whether it is a “law of nature” or “discovery”, but rather whether it has practical application in the field of economic endeavour. If so, the subject matter is inherently patentable even though it concerns abstract information.⁵⁵

4. WHY $E=mc^2$ IS INHERENTLY PATENTABLE (AT LEAST IN THE U.S. AND AUSTRALIA)

An argument can be made to the effect that, in practice, there is no meaningful inherent patentability requirement currently operating under U.S. or Australian patent law. In the U.S., this position has resulted from the cumulative effect of a series of decisions by the Court of Appeals for the Federal Circuit, commencing (arguably) with *Arrhythmia Research Tech. v Corazonix Corp.*⁵⁶ and culminating (but by no means ending) with *State Street*.⁵⁷

In Australia, this position has pertained since, and indeed as a result of, the decision of the High Court in *NRDC*. Whilst the *NRDC* decision has been labelled a “watershed” decision,⁵⁸ it can be argued that it is in fact a “bombshell” decision, and for a reason somewhat different from that for which the “watershed” epithet is attributed. It is commonly thought that *NRDC* is a watershed decision because it generalised the concept of and test for inherent patentability, and thus it is the source of the modern law on the inherent patentability requirement. It might be said that *NRDC* is in fact a bombshell decision, because it so generalised the concept of and test for inherent patentability that in practice the requirement has been annihilated. Similarly strong words have been used to describe the impact on U.S. law of the *State Street* decision.⁵⁹

The evidence that can be adduced in support of the argument that the inherent patentability requirement has no practical meaning is the practice of the Australian and U.S. patent offices, and the decisions of the Australian and U.S. courts, since the *NRDC* and *State Street* decisions. The traditional view is that the inherent patentability requirement precludes the patenting of abstract information. The USPTO and APO practice, and the U.S. and Australian court decisions, in relation to computer programs, mathematical algorithms, and business methods show that this view is essentially fallacious. Claims to such subject matter are inherently patentable so long as they include some “reduction to a practical application” (under U.S. law) or some “manner of implementation” (under Australian law). This requirement of practical

⁵¹ *O'Reilly v Morse* 56 US (15 How.) 112. Note, however, that a more general claim to the use of electromagnetism “however developed, for marking or printing intelligible characters, signs or letters, at any distances” was held invalid, since it went beyond the teaching of the specification: *ibid*, 124.

⁵² (1948) 333 US 127, 134-135.

⁵³ (1959) 102 CLR 252, 263-264.

⁵⁴ (1959) 102 CLR 252, 264.

⁵⁵ *Ibid*.

⁵⁶ 958 F.2d 1053 (Fed. Cir. 1992)

⁵⁷ 149 F.3d 1368, 1375 (Fed. Cir. 1998).

⁵⁸ *Ccom v Jiejing* (1994) 28 IPR 481, 507.

⁵⁹ See, for example, Merges “As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform” (1999) 14 *Berkeley Technology Law Journal* 577; and Thomas “The Patenting of the Liberal Professions” (1999) 40 *Boston College Law Review* 1139.

application or implementation is easily satisfied - any application or implementation, including in particular the use of computers, is sufficient.

It can be argued that this requirement of practical application or implementation is of no practical significance. This is especially true in relation to business methods, schemes and plans. The so-called "new economy" businesses are, by definition, conducted almost exclusively through computers and the Internet. But even in relation to "old economy" businesses, computers are ubiquitous, and automation of activity (and hence implementation of schemes and plans) through the use of computers is the rule. In light of this fact, it can be seen that the requirement of "practical application" or of "implementation" is not a practical point of distinction between the inherently patentable and the inherently unpatentable. In short, there is no test for inherent patentability that has any practical meaning.

The consequences of this reality may be profound. In particular, it seems to follow from the above conclusion that all abstract subject matter is, in practice, inherently patentable. That this is so can be seen by returning to that classic example of inherently unpatentable abstract subject matter, the Einstein equation. According to the practice of the USPTO and the jurisprudence of the Court of Appeals for the Federal Circuit, it seems that a claim to this subject matter is inherently patentable under U.S. law, at least so long as the claim embraces a method of using a computer to carry out the calculation. This could be done by adopting "means-plus-function" language in the claims, and including appropriate reference to physical structures such as computers, disk storage media and screen displays in the written description of the invention.

Thus, an inherently patentable claim to the Einstein equation under U.S. law might read along the following lines (which is a mapping of the equation onto the format and content of claim 1 of the *State Street* patent):

- A data processing system for determining the energy content of a physical entity, comprising:
- (a) a computer processor means for processing data;
 - (b) storage means for storing data on a storage medium;
 - (c) first means for initializing the storage medium;
 - (d) second means for retrieving from storage medium data regarding the mass of the physical entity;
 - and
 - (e) third means for processing data regarding mass of the physical entity by multiplying said data by a constant value representing the square of the speed of light through a vacuum.

Furthermore, it is strongly arguable that "means-plus-function" language is in fact not necessary to confer inherent patentability on this subject matter. As suggested by way of *obiter* in *State Street*,⁶⁰ and stated expressly by way of *ratio* in *Excel*, "the scope of § 101 [is] the same regardless of the form - machine or process - in which a particular claim is drafted".⁶¹ Thus, it should be sufficient to ensure inherent patentability if the claim merely recites "a method for use in a data processing system" and then sets out the relevant steps⁶² - which, in this case, would be include the key step of multiplying the value representing the mass of the entity by a constant value representing the square of the speed of light through a vacuum.

Under the Australian approach as described in the APO Manual, a claim as follows is inherently unpatentable:

- a method of calculating a value E, using the formula:
 $E=mc^2$
 where E, m and c are pure variables with no defined significance to the real world

The fact that such an equation is not patentable is of no significance, because such an equation has no value unless the variables E, m and c describe physical entities in the real world, such as energy, mass and the speed of light. Once these variables are defined to describe such physical entities (which, of course, they do in the Einstein equation), the claim is inherently patentable.

⁶⁰ 149 F.3d 1368, 1372: "We note that, for the purposes of a § 101 analysis, it is of little relevance whether claim 1 is directed to a "machine" or a "process", as long as it falls within at least one of the four enumerated categories of patentable subject matter, "machine" and "process" being such categories".

⁶¹ *Excel* 172 F.3d 1352, 1357.

⁶² See, for example, claim 1 of U.S. Patent No. 5,333,184, which was one of the claims in issue in *Excel*.

That is to say, the following claim *is* inherently patentable, according to the expressed practice of the APO, and the principles of the Australian courts:

A method of determining the energy content (E) of a physical entity, by applying the formula:

$$E=mc^2$$

where m is the mass of the entity, and c is the speed of light through a vacuum

5. CONCLUSION

If it is accepted that, contrary to common understanding, the Einstein equation is inherently patentable under U.S. and Australian law, then one of two conclusions must be drawn: either the common understanding is wrong, or the law which leads to the result contrary to the common understanding is wrong. That is to say, either fundamental formulae are inherently patentable, or the court and patent office interpretations of the inherent patentability requirement as it applies to computer programs, mathematical algorithms and business methods are mistaken. Whilst it may be too early to be certain which conclusion is correct, it is clear that the courts and patent offices must give further consideration to this important issue. The alternative is to remain in the dark about a fundamental matter, relatively speaking.