Where Laws Conflict: an Application of the Method of Chunk and Permeate

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1   Introduction: Law and Logic

In his classic *Legal Traditions of the World,*[1] Patrick Glenn documents and explores the fact that the world contains many different legal traditions, often inconsistent with each other; indeed, even a single tradition can contain different sub-traditions that may be inconsistent with each other. Moreover, these traditions may interact with and inform each other in complex ways. In ch. 10, he raises the question of how to view this matter from the perspective of formal logic. The point of this essay is to address the question.

2   Many-Valued and Modal Logic

In a section of chapter 10, 'Bivalence and Multivalence', Glenn suggests that many-valued logic, and particularly fuzzy logic, may provide what is required. I think that this is the wrong machinery for the job. Let me explain why, before I explain what I take to be the right machinery.

   In standard logic, there are just two truth values, *true* and *false*. In many-valued logics, there are more than two. Thus, in fuzzy logics, there is

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[1]Glenn (2014).

a continuum of truth values, all the real numbers in the interval between 0 (completely false) and 1 (completely true). Moreover (and this is crucial), the truth value of a complex sentence, such as a conjunction ($\wedge$) or a negation ($\neg$), is determined completely by the truth values of its parts. Thus, for example, if we write the value of the statement A as $|A|$, in standard fuzzy logic, $|\neg A| = 1 - |A|$, and $|A \wedge B| = Min(|A|, |B|)$.[2]

If this machinery is to be applied to the situation concerning different legal traditions, it must be explained what each of the plurality of truth values means in this context. Nothing seems to be appropriate. The only things that suggest themselves are to interpret some value as *both true and false*, or—perhaps Glenn's favourite—*half true/false* (0.5 in fuzzy logic). These understandings misdescribe the situation, however. Calling something *half true/false*—call this value i—is the wrong way to characterise a claim, A, over which different legal traditions disagree. A is, in fact, *wholly* true/false: it is wholly true according to one tradition, and wholly false according to another. Even to say that it is both true and false is to misdescribe the situation, because it is true *according to one tradition* and false *according to another*. The qualifications are important.

To see this, just consider the case of a conjunction, $A \wedge B$. In every standard many-valued logic, if $|A| = |B| = i$ then $|A \wedge B| = i$. Now suppose that A holds in one tradition, and $\neg A$ holds in another. Then they have the same status, and so truth value. If conjunction behaves in the way described, then $A \wedge \neg A$ will have the same truth value as A and $\neg A$. But characteristically, $A \wedge \neg A$ will not have the same status: it will be rejected by *both* traditions.[3]

To do justice to the phenomenon in question, we need to make sense of the thought that the status of a claim is relative to a tradition. The obvious machinery to apply here, to one trained in the contemporary techniques of non-classical logic, is not many-valued logic, but modal logic.

In a standard modal logic, an interpretation for the language is a collection, W, of things normally called 'possible worlds'.[4] Statements at each world are two-valued, the values being *true* and *false*. But the value of a sentence may change from world to world. To compute the value of a con-
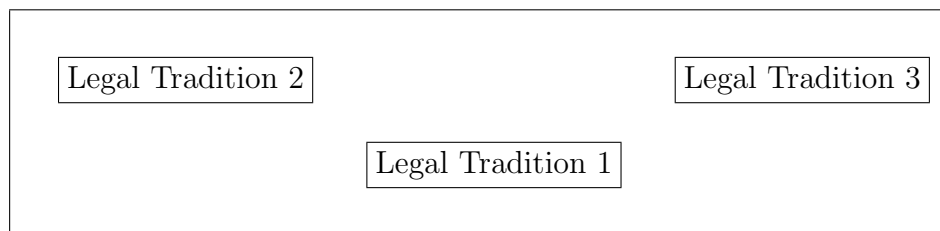
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[2] See Priest (2008b), chs. 7, 11.

[3] Nor does it really help to suppose that conjunction works in some other way. The point is that the status of a conjunction will *not* be determined by the statuses of the conjuncts, as required by many-valued logic.

[4] See Priest (2008b), ch. 2.

junction or negation at a world, the standard rules of classical logic apply. Thus, $A \wedge B$ is true at a world if both A and B are true at that world; and $\neg A$ is true at a world if A is false there.[5] And what is true at a world will be closed under an appropriate notion of logical consequence (classical, in the standard case). In other words, if all of $A_1, ..., A_n$ hold at a world, and $\{A_1, ..., A_n\} \vdash B$ (B follows from $A_1, ..., A_n$), then B holds at the world. Indeed, the standard definition of validity normally given for modal logics is that an argument is valid *just if* it preserves truth at any possible world (in all interpretations).

Though possible worlds are usually given a metaphysical interpretation, they may be given many kinds of interpretation. It is common, for example, to think of them as bodies of information. In the present context, it is natural to think of the worlds as legal traditions. What holds (is true) at a world is what holds according to that tradition. A claim can then be true at one world, and false at another. And the fact that the content of each world is closed under the appropriate consequence relation, is just a way of representing the fact that reasoning plays an important role in legal traditions: given a tradition, people use things that hold in it to infer other things that hold. Thus, one can think of the content of each world as all the matters of law in some tradition, plus all the matters of fact, plus whatever follows from them by acceptable reasoning. The picture, then, is this, where the outer box contains all the "worlds", and the inner boxes are the different traditions (three in this case):

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│  ┌──────────────────┐              ┌──────────────────┐   │
│  │ Legal Tradition 2 │             │ Legal Tradition 3 │  │
│  └──────────────────┘              └──────────────────┘   │
│              ┌──────────────────┐                         │
│              │ Legal Tradition 1 │                        │
│              └──────────────────┘                         │
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[5]A very distinctive feature of modal logics is the appearance of modal operators, such as '$\Box$' ('it is necessarily the case that'). Typically, $\Box A$ is true at a world if A is true at *all* worlds (of a certain kind). We do not need to go into details for present purposes. I note that in 'The Applications of Bivalent Logic, and the Misapplication of Multivalent Logic to Law', p. *** of this volume, Andrew Halpin suggests using an operator, P, *it is determined that*. To a modern logician's eye, the most natural semantics for such an operator is a modal semantics, with P is some kind of necessity operator, the accessibility relation of which is at least reflexive (so that it is a logical truth that $PA \supset A$). See Priest (2008b), ch. 3.

Let me make it clear that I am not denying the appropriateness of the use of many-valued logic in an analysis of legal reasoning. Indeed, in the next section I will argue that a paraconsistent logic may well be required; and some paraconsistent logics are many-valued logics.[6] My claim that a modal logic is requred, rather than a many-valued one, is with respec to the situation in which one is required to deal with multiple traditions.

3 Paraconsistent Logic

So much for the basic idea. There is, of course, much more to be said. At this point, I need to introduce the notion of *paraconsistency*. Consider the logical principle that any contradiction implies anything: $\{A, \neg A\} \vdash B$ (for all A and B). This goes by the medieval name of *ex falso quodlibet*, and the more colourful contemporary name of *Explosion*. It says that once a body of information contains a contradiction, everything follows from it. The principle of inference is valid in standard logics, including standard modal logics (just because there is no world at which contradictory statements hold). Logics in which the inference fails are called *paraconsistent logics*. Explosion hardly looks plausible for many applications of logic. In particular, many legal traditions seem to contain contradictions, which do not "explode" them. It would appear, then, that legal reasoning should require a paraconsistent logic.

The matter is a sensitive one.[7] It is of course to be expected that the legal principles of any one tradition will contain *prima facie* contradictions. And usually, legal systems will have principles which resolve some of these. Thus, something enshrined in constitutional law will trump something inconsistent with it in statute law. And the principle of *lex posterior* tells us that a later law will trump something inconsistent with it in an earlier law.[8]

But all of this notwithstanding, there are going to be cases of genuine

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[6]In his paper in this volume, pp. ***, 'Fuzzy Law: a Theory of Quasi-Legal Systems', Oren Perez argues that a fuzzy logic is required to deal with legal concepts that are vague; and in his paper in this volume, pp. **, 'Conjunction of Evidence and Multivalent Logic', Kevin Clermont argues that a fuzzy logic is required to deal with conjunctions of legal conclusions.

[7]The material in the next few paragraphs is taken from Priest (2006a), ch. 13.

[8]In his paper, 'Fuzzy Law: a Theory of Quasi-Legal Systems', p. *** of this volume, Oren Perez explores a different way in which conflicting laws may be reconciled, in a certain sense, when they are "soft", in a process he calls 'deliberative coherence'.

inconsistency. Actual cases at law are always going to be messy and contentious; so let me give a toy example. Suppose that a duly authorised statute contains the following clauses:

1. All property-holders shall have the right to vote.

2. No woman shall vote.

We may suppose that at the time when the statutes were authorised, the thought that a woman might hold property was just unthinkable; and maybe that there are other clauses in the statute determining which male non-property-holders may vote.

In due course, we may also suppose, as enlightenment creeps over the society, women do come to hold property; and at some point, a woman—call her Jan—eventually fronts up at a polling booth demanding to vote. Jan may and may not vote.[9]

Of course, if and when this happened, the law would, in due course, be changed, either by a judge making a ruling, or by new legislation. The law is a guide for action, and contradictions frustrate this. But, until this is done, the law (plus the contingent circumstances) is inconsistent. And until the law is revised, there being no general principle of the kind just noted to resolve the contradiction in this case, *both* clauses are operative, as may be shown by the fact that each may be appealed to independently in other cases. However, no one would go into court and use this contradiction to argue that their cat has a right to vote. That would just be silly. In other words, Explosion is not a valid principle of legal argumentation in this context.

What this shows is that, in general, the logic operative in many, perhaps most, legal traditions, and under which the information in each of the "worlds" is closed, must be a paraconsistent one. Standard modal logic is not of this kind, but it is easy to construct modal logics where the logic is paraconsistent. The logic of each world may be a simple many-valued paraconsistent logic, for example.[10]

Paraconsistent logic is also relevant in another way. There is a standard mechanism for generating a paraconsistent logic out of a world-semantics. Given an interpretation, we simply define truth *simpliciter* (not truth at a world) as truth at *some* world. Explosion then fails for this logic (even if

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[9]The point is contested by JC Beall in his contribution to this volume. A discussion of his comments is too long for a footnote, so I defer it to an appendix of this essay.

[10]See, e.g., Priest (2008b), ch. 11a.

the logic of each world is explosive), since A may be true at one world, $\neg A$ at another, and B at no world. This procedure gives a *discussive* logic.[11] The main feature of a discussive logics is that the principle of Adjunction, $\{A, B\} \vdash A \land B$, fails (since A and B may hold at different worlds, and their conjunction at neither). This is a natural way of viewing the legal case. Truth (*simplicter*) is holding in some legal tradition or other; and one should not expect Adjunction to hold for truth *simpliciter*. The legal cosmos is just a complex, many-faceted, place.[12]

4   Interactions Between Legal Systems: Examples

So far so good. The problem is that it's not that simple. The only real problem on the horizon so far is determining which "world"—jurisdiction—we are in. There will doubtless be occasions when this is debatable, but usually it will be clear enough. The real trouble is that each world is not an island. The different systems and traditions interact, importing information from other traditions, even ideas that sometimes contradict the home tradition. Let me give three examples of this. I will then discuss how matters are to be handled logically.[13]

Example 1 A court can import a ruling from outside its jurisdiction. To take an historical example, the secular law might provide that inheritance go to the first "legitimate" offspring of a person. But, in certain cases, a civil court might allow what counts as legitimacy to be determined, not by civil law, but by canon law.[14]

Example 2 A court can import a precedent from another jurisdiction.[15] For example, in Australia, a Federal court may sometimes appeal to a precedent in State law (maybe not even the State where the case is being heard).

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[11] See Priest (2002), pp. 299-302.

[12] This is essentially how things work in Jaina logic. See Priest (2008a).

[13] The examples all concern reasoning to a judgment, which is our topic here. But one should note that importation can happen at other places as well. For example, in Australia, an Aboriginal may be punished for a crime by their community, under Aboriginal customary law. If they are then tried by a state court for the same crime, the judge may take into account the fact that some punishment has already been received in determining the appropriate sentencing. See Australian Law Reform Commission (1986), Section 507.

[14] See, e.g., Baker (2002), p. 489f.

[15] See, e.g., Adam and Pyke (1998), pp. 67, 122f.

Example 3 In contract law, a court may choose to enforce the terms of a contract according to the laws of another jurisdiction.[16] For example, suppose that a and b, in countries A and B, make a contract concerning matters that will transpire in some other place, C, it being made clear that the laws of C shall govern their contract. a may then choose to sue b for breach of contract in A. The court may find against b on the ground that it was a breach of contract according to C's laws, even though it is not a breach of contract according to A's. Aspects of C's laws not relevant to laws of contract, such as laws of evidence, need not be accepted, though.

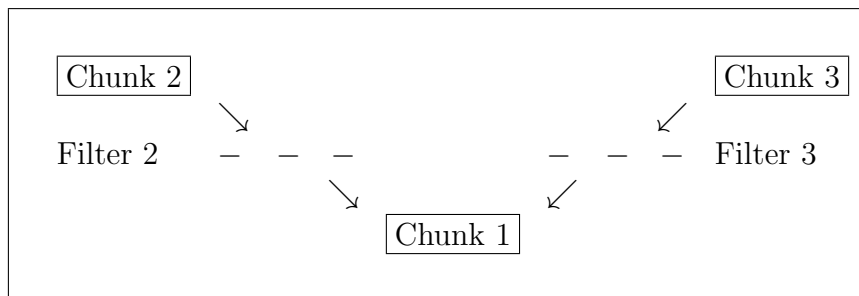# 5   Chunk and Permeate: the General Framework

In this section I will explain a general logical framework for handling such matters. In the next, we will see how it may be applied to our three examples. The framework is called 'Chunk and Permeate', and was originally developed for cases in science where mutually inconsistent information is appealed to in a single application.[17]

We suppose that our information is chunked. Information is then allowed to flow between chunks. Thus, information may permeate from a source chunk into a target chunk. The information that permeates may then be used as part of the information available for reasoning in the target chunk. It is crucial, however, that not all the information forthcoming in a source chunk be allowed to flow into the target chunk, or this may have untoward consequences; most notably, it may be inconsistent with something else already present in the target chunk. To prevent this, a filter is applied, letting through only information of a certain, predetermined, kind. A simple picture is something like this:

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[16]See, e.g., Davies, Bell, and Brererton (2014), pp. 441ff.

[17]The first application of the model came from considering the infinitesimal calculus of the 17th and 18th centuries, where inconsistent properties of infinitesimals were appealed to, systematically, at different points in a computation. The model is, however, a very versatile one. For other applications, see Brown and Priest (2015) and Priest (2014).

Chunk 1, we may suppose, is the "output chunk", that is, the place where we look for our final conclusions. The structure is called a *Chunk and Permeate structure.* The general mechanism of such a structure is more complex than I have so far explained, but the extra complexities are not relevant for our purposes.[18]

6 Application

Let us now turn to its application to our examples of Conflict of Law. In general, how to chunk information in an appropriate way is a non-trivial matter. But in the present case, it is straightforward. The chunking is already provided by the "worlds", that is, the different legal traditions. We need, in addition, an output chunk (let us call this 'Chunk 1' in what follows), which we suppose to contain all matters of fact. Each of the other chunks contains the matters of law pertaining to a relevant legal tradition. In principle, there can be an arbitrary number of these, but for our examples, two will suffice (Chunks 2 and 3). Given the appropriate filters, legal information is allowed to flow into Chunk 1, where it is applied to the factual information already present there, to determine a final judgment. Let us see how this mechanism is applied in our three examples.[19]

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[18]Details of the general case can be found in Brown and Priest (2004).

[19]I am assuming that each tradition is itself a unit; but in realistic cases, it may itself have a chunk and permeate structure. Structures can be nested in structures. I empasise also that many of the features of my three examples (e.g., the number of chunks, where to put the "facts", etc) are just artifacts of the way I have chosen to handle these cases. The chunk and permeate structure itself is much more general, and can be implemented in diferent ways—for example in the way that Lionel Smith does in his essay in this volume, 'Law and Equity: Chunk and Permeate?', pp. ****. But there must always be an output chunk, where the ultimate judgment is to be found.

Example 1 Here, Chunk 2 may be taken to contain all the legal information of the jurisdiction of the court. Filter 2 may let through everything except those laws relating to legitimacy. Chunk 3 may be taken to contain all the principles of Canon Law. Filter 3, however, lets through only matters pertinent to judgments of legitimacy. One would not want other things from Chunk 3 to flow into Chunk 1, simply because one would not want them to be operative. When, in Chunk 1, the judgments about inheritance from Chunk 2 and the principles of legitimacy from Chunk 3 are applied to the facts in Chunk 1, an appropriate judgment is drawn.

Example 2 Here, Chunk 2 may be taken to be the legal information relevant to Federal Law. Filter 2 may, this time, let everything through.[20] Chunk 3 may be taken to contain matters from the State law of the relevant state, including judgments based on precedent. Filter 3 lets through only the judgement of precedent relevant to the present case. Clearly, letting through other matters is very likely to conflict with matters of Federal law in this case. In Chunk 1, the judgment of precedent may then be appealed to in applying the Federal law to the matters of fact present.

Example 3 Here, Chunk 2 may be taken to contain the laws of jurisdiction *A*. In this case, the filter allows through *only* those things not relevant to the laws of contract (e.g. laws relating to permissible evidence). Chunk 3 may be taken to contain all the laws of jurisdiction *C*. Filter 3, however, lets through only those things relevant to laws of contract. When all the available information from Chunks 2 and 3 is then applied to information in Chunk 1, the appropriate judgment is forthcoming.

So much for the examples. There has to be a bit more to the general story than this. Something must determine what the relevant chunks and filters are. (The whole Chunk and Permeate structure which is operative must be determined by *something*.) Presumably, this is itself the jurisdiction we are actually in (Chunk 2, in our examples).[21]

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[20]We could then, if we wished just amalgamate Chunks 1 and 2 into a single chunk in this case.

[21]In the conclusion of 'The Applications of Bivalent Logic, and the Misapplication of Multivalent Logic to Law', p. *** of this volume, Andrew Halpin writes:

> As for the law, the conclusion of this chapter is that paraconsistent logic has nothing to offer; a conclusion in part supported by Graham Priest in his contribution to this volume, when he considers a move from the existence of contradictory norms within legal materials to their resolution at the point of judgment. At this point, Priest suggests a role for "chunk and permeate"

7 Conclusion: Logic and Law

An important part of the law is reasoning.[22] It is the job of the discipline of logic to theorise reasoning. This does not mean that lawyers have to take notice of the discipline of logic (though occasionally this may help): they just have to know how to reason well. Similarly, it is the job of the discipline of linguistics to theorise language. People whose job it is to speak and write, do not, however, have to take notice of this (though occasionally this may help): they just have to know how to speak and write well.

Logical theory in the history of Western philosophy has been dominated by the notion of deductive reasoning.[23] Most notably, in the last 100 years, it has been dominated by reasoning in mathematics. The tools of "Classical Logic" (or more aptly, 'Frege-Russell Logic', after its inventors), were developed with this in mind. Though many have sought to impose a hegemony of classical logic, this is now coming to appear an unduly imperialistic attitude. In particular, the many different techniques of non-classical logic developed in the last 50 years, such as those of modal logic, many-valued (including fuzzy) logic, paraconsistent logic, can be seen as providing a more versatile and robust armoury of devices for analyzing reasoning in other areas (and

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logic, in tracking the influence of normative material from one normative order to another. But as he acknowledges, this only operates after the event, crucially, after the "chunks" and "filters" have been chosen, so transferring attention to the extra-legal factors at play in selecting the chunks and setting of the filters.

A couple of comments are in order here. The inference engine delivered by the model of chunk and permeate is paraconsistent in the following sense. The total amount of information available to be reasoned from (the union of all the chunks) may certainly be inconsistent. Yet not every conclusion is delivered. Next, though there is nothing in the model which requires the internal logic of each chunk to be paraconsistent, the material in Section 3, above, suggests that it may be. Thirdly, I think it is too fast to say that the determination of the chunks and filters is determined by extra-legal factors. Clearly legal factors may be involved. Thus, in a federal system, where the jurisdiction lies (i.e., which chunk is terminal) may be determined by federal constitutional law.

[22]Of course, it is only one part: there is much more to the law than reasoning. For a discussion of some other aspects of law, see Haack (2007).

[23]Non-deductive reasoning, of course, plays an enormous part in ordinary and legal reasoning. The machinery explained in this essay concerns deductive reasoning. It can be generalised to machinery for non-deductive inference by applying the techniques of non-monotonicity. However, this complication is not necessary for present purposes. For a brief summary of the techniques of non-monotonicity, see Priest (2006b), 11.7.

maybe in some bits of mathematics too). The area that has been our concern in this essay is legal reasoning, especially in the context of the multitude of legal traditions and their interactions. This, it seems, is such an arena.[24]

8   Appendix Beall and *Release*

In 'Do Inconsistent Laws Deliver Gluts?', this volume, pp. ***, JC Beall takes issue with my claim of Section 3, that the law can deliver genuine inconsistencies, that is, dialetheias, that is, true things of the form A and $\neg A$.

His point is essentially this. A claim of law, A, such as 'one must drive on the left hand side of the road' or 'people under 18 may not vote', is always relative to a jurisdiction. So, when properly understood, it is to be understood as of the form: *According to the law A*. Beall writes this as OA. Actually, it is better to make the jurisdiction explicit. So let JA be 'According to jurisdiction j, A'. So far so good. Next, Beall observes, J does "Release"; that is, one cannot infer A from JA; and such an inference is required to deduce a contradiction. Again, so far so good. Dialetheias, infers Beall, do not arise.

Too fast. J certainly does not release in general. If I am driving in the US, and j is Australian jursidiction, I cannot infer from J(I must drive on the left) to 'I must drive on the left'. But one *can* release if one is in the jurisdiction in question. Merely consider, for a moment, the following dialogue between a shopkeeper (s) and a customer (c).

- (c) A packet of cigarettes, please.

- (s) How old are you?

- (c) 16

- (s) I'm sorry, you can't have it.

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[24]For advice on legal matters, thanks go to David Wood and Marcus Priest. For helpful comments on an earlier draft of the essay, I'm grateful to Kevin Klermont, Andrew Halpin, Owen Perez, and Lionel Smith. A first draft of this paper was given in June 2011, at the the Workshop on Multi-Valued Law and Multivalent Logic, organised by Patrick Glenn in Wassennar, the Netherlands. I am very grateful for his invitation to engage with the subject, and his subsequent encouragement. It is sad that he did not live to see the present project to fruition. I dedicate this essay to him.

- (*c*) Why not?

- (*s*) It's the law. The law says that if you are under 18, I'm not allowed to sell you cigarettes. So I can't give them to you.

The shopkeeper has exactly used "Release". He knows the legal jurisdiction he is in, and knows its law. He "releases" to the conclusion that if a person is under 18 a shopkeeper may not sell cigarettes to that person. He joins this to the premise the 16 is less than 18, to conclude that he is not allowed to sell to *c*.

In exactly, the same way, in the example of Section 3, let us suppose that the legal jurisdiction in which Jan finds herself is *j*. Then *J*(All property holders have the right to vote) and *J*(No women has the right to vote.) The person in control of the polling booth is, again, well aware that they are in jurisdiction *j*. They "release" to infer that all property holders have the right to vote, and that no women have the right to vote. A few more simple inferences shows them that they are in a bind.

It might be suggested that the *whole* inference process is under the scope of the *J* operator, so any ultimate conclusion is of the form *JA*, which is not a contradiction. Thus, to illustrate, consider the shop-keeper example again. *s* knows that *J*(One must not sell cigarettes to people under 18) and *J*(c is under 18) and concludes that *J*(I should not sell cigarettes to *c*). This is hardly a correct way to reconstruct the reasoning. *c*'s age is a matter of fact, not a matter of law. It is simply about the time elapsed since *c*'s birth. One cannot, therefore move from '*c* is under 18' to *J*(*c* is under 18).[25]

And in any case, the move is of no avail. Even if the conclusion of the explicit reasoning is of the form *JA*, if one is in jurisdiction *j*, one must still apply "release". The law is action-guiding, and release needs to be applied to infer what to do. So imagine that *s* does, in fact, sell cigarettes to *c*, at which point a police woman, *p*, enters the shop. The following dialogue ensues:

- (*p*) Did you just sell cigraettes to this kid?

- (*s*) Yes.

- (*p*) You shouldn't have done that.

- (*s*) Why?

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[25]Beall calls this inference *Capture*, and is clear that the inference is invalid. The truth predicate, he says, is unique in satisfying *Capture*. (See his note at the end of 4.2.)

- (p) Because the kid is under 18, and the law forbids selling cigarettes to minors.

- (s) Yes, I know the law forbids selling cigarettes to minors.

- (p) So you shouldn't have done it.

- (s) That doesn't follow.

The police woman is not impressed

Beall buttresses his argument by an extra *ad hominem* argument. If the law delivers gluts (things that are both true and false), it also delivers gaps (things that are neither true nor false).

His example is where the law in jurisdiction, j, says that persons in category $C(x)$ must do such and such, $A(x)$; and some person, a, is such that whether or not $C(a)$ is indeterminate (maybe bacause the matter is vague). Then, says Beall, neither $A(a)$ nor $\neg A(a)$ is true. No. By Beall's own account, what holds is that $\neg JA(a)$ and $\neg J \neg A(a)$. This is compatible with $J(A(a) \vee \neg A(a))$, and so, given that we are in jurisdiction j, to $A(a) \vee \neg A(a)$.

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