

Commentary on: Joseph Laronge's "A clear logical argument guaranteed: Defeasible Class-Inclusion Transitivity (DCIT)"

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1. INTRODUCTION

Joseph Laronge has developed a method for framing the main argument in support of some claim as an Aristotelian sorites: a set of categorical statements that are linked in such a way that one of them (historically termed the minor premiss) shares its subject with the claim, another one (historically termed the major premiss) shares its predicate with the claim, and each other term that is the subject of one premiss is the predicate of another. Using numbers rather than letters for the terms, we can exhibit the form of the reasoning, alongside one of Laronge's examples, as follows:

<subject> <1>	The President has a Hawaiian birth certificate.
every {one/thing} that <1> <2>	Everyone that has a Hawaiian birth certificate is a natural-born U.S. citizen.
:	
every {one/thing} that <n - 1> <n>	∴ The President is a natural-born U.S. citizen.
∴ <subject> <n>	

In this form n can be any finite number from 2 up. The minor premiss (i.e. the one with the same subject as the conclusion, which is listed first) and the conclusion can have as their subject either a term denoting an individual (i.e. either a name like 'Barack' or a definite description like 'The President') or an existential or universal quantifier followed by a noun phrase (e.g. 'some court official' or 'every aardvark'). Every non-minor premiss is a universal affirmative premiss, for which Laronge uses as frames such phrases as 'any such that', 'any one that', 'one who', or 'one that'. I have taken the liberty of using the frame 'everyone that' or 'everything that', which sound natural and can be used for any subject-predicate combination. Terms 1 through n are singular verb phrases (e.g. 'has a Hawaiian birth certificate', 'was mortally wounded').

Laronge claims that arguments can generally be regimented in this way, and he gives us many examples of how to do so. An advantage of this sort of regimentation is that it makes immediately obvious whether there is a complete linkage from the subject of the conclusion to its predicate via the middle terms 1 through $n - 1$ that occur in the n premisses. Whether the linkage is complete becomes especially clear if one orders the premisses by putting the minor premiss first and then having each subsequent premiss introduce just one new term as predicate. One just needs to check that the subject of the new premiss exactly matches the predicate of its immediate predecessor. Laronge's logic bridge makes this linkage obvious. Even more helpful is the

template that one can use to insert the subject of the conclusion and the predicates of the premisses (each of which becomes automatically the subject of the immediately following premiss). One can see at a glance whether one has a formally valid argument.

This is “class-inclusion transitivity”, the inference that the subject is included in n because the subject is included in 1, which is included in 2, which is included in 3, and so on up to n . The logic of such reasoning becomes defeasible once one admits premisses that are not strict universal generalizations but are subject to exceptions.

Of course, any premiss of such an argument might need support. If the support takes the form of an argument using defeasible class-inclusion transitivity, then the premisses of that supporting argument take the place of its conclusion and become themselves main premisses. An example is the replacement of the challenged premiss that the President is a natural born U.S. citizen by the support that the President was born in Hawaii and that everyone that was born in Hawaii is a natural-born citizen. In other cases, however, the support takes the form of a non-linking so-called “assumption” which is depicted in the logic bridge by a vertical line underneath the premiss that it supports, with one or more statements at the base of the vertical line. (The logic “bridge” is in this respect analogous to a specific type of bridge, a cantilever bridge, in which the support for a span is in the middle of it rather than at either end.)

2. INITIAL RESPONSE

Laronge’s project is likely to provoke immediate scepticism from those of us who learned as we were drinking our mother’s milk that the categorical statements for which Aristotle developed his logic are only a small subset of the statements that occur in people’s reasoning. What about singular statements whose subject is not the subject of our desired conclusion, we will wonder. What about relational statements, which since Frege’s *Begriffsschrift* we have learned to construe as having a dyadic or polyadic predicate with an ordered pair or n -tuple as subject? What about negations, whether of simple or complex statements? What about complex statements formed using sentence connectives, such as conditionals and conjunctions and disjunctions? What about nested quantifiers? What about identity? What about modal operators of various sorts and their logic? Can all of this be somehow subsumed by regimenting statements as universal affirmative categorical subject-predicate statements? Even if we can regiment them, does the logic of the regimented statements capture everything that we can capture in, say, classical first-order logic and its extensions?

I suggest that for the time being we put such sceptical worries on hold. After all, Laronge has shown us how to express a number of different types of statements as universal affirmatives. Further, he has been using this system in litigation contexts for nine years, and has found that it works. Further, there is a serious and respectable detailed proposal by Fred Sommers and George Englebretsen to construe the logical form of the statements that we use in natural language reasoning in accordance with the subject-predicate analysis that has come down to us from Aristotle.

So, rather than picking holes here and there, I propose that we see how far Laronge’s approach can take us. For there are obvious merits in being able to visualize diagrammatically not just the statements that compose an argument and what inferences compose its macro-

structure, but also the logic by which the argument's main conclusion follows from the premisses offered directly in its support. Also, the logic bridge enables us to depict the flow of certainty from the minor premiss to the conclusion. For each premiss, we can incorporate as a percentage a degree of certainty that reflects both our subjective degree of confidence in its truth and our estimate of how frequently the universal generalization has exceptions. The degree of certainty of the conclusion, given the DCIT argument in its support, will then be the product of the degrees of certainty of each premiss. A two-premiss DCIT argument with 90% certainty about the first premiss and 100% certainty about the second makes us 90% certain of the conclusion. A five-premiss DCIT argument with 95% certainty about each premiss makes us 77% certain of the conclusion. Laronge illustrates the calculation vividly by having a truck bearing a "load of certainty" cross the "logic bridge" from the subject of the conclusion to its predicate. The truck starts with 10 boxes on its bed, each box representing 10 percentage points of certainty. If the addressee has only 50% certainty that the first premiss is true, the truck loses half its load. Subsequent premisses with less than 100% certainty will diminish proportionately the number of boxes remaining on the truck bed. This visualization of subjective probability assignments to the premisses and of the effect of those assignments on the strength of support for the conclusion is an ingenious and marvelous invention. In a legal context, the underlying theory holds out considerable promise. If we can put numbers on the concepts of proof beyond a reasonable doubt and of proof on a clear balance of probabilities, we can use the logic bridge to determine whether an argument in a legal case has met the relevant standard of proof. That is a substantial benefit.

In the spirit of seeing how far we can go with DCIT, I comment on three topics: argument schemes, certainty, and assumptions.

3. ARGUMENT SCHEMES

Laronge gives us examples of regimenting three argument schemes as categorical syllogisms: appeal to a source, argument by analogy, and generalization from a sample. As sub-types of appeal to a source, he gives us examples of three kinds of source: witness testimony, expert opinion, instrument readings.¹ In each case, the basic scheme is regimented as a categorical syllogism and the critical questions come in as supporting assumptions for the major premiss, which in Walton-style presentations of argument schemes is a defeasible generalized conditional. One might wonder whether such regimentation is possible for all argument schemes. I would argue that it is. If one boils them down, and one omits the inference-licensing defeasible conditional (Laronge's major premiss), each argument scheme has one premiss and one conclusion. As Jean Wagemans and I have demonstrated², such one-premiss schemes can be

¹Laronge comments in detail on these same schemes and sub-schemes, with the same examples as in his slides for his eColloq presentation, in lecture 10 of his Udemy course, which can be found at <https://www.udemy.com/a-clear-logical-argument-guaranteed/>. The course presents the DCIT approach in a series of 32 short, easy-to-understand lectures with slides.

²Hitchcock, David, and Jean Wagemans. "The pragma-dialectical account of argument schemes." *Keeping in touch with pragma-dialectics*, ed. BJ Garssen, and AF Snoeck Henkemans (2011): 185-205.

regimented so that the premiss and conclusion are both in subject-predicate form. So regimented, they divide naturally into two main kinds: those with a common subject where the attribution of one predicate is used as the basis for attributing another predicate to the same subject, and those with a common predicate where the possession of the predicate by one subject is used as the basis for attributing the same predicate to another subject. We called schemes of the first type “predicate-transfer schemes” and schemes of the second type “referent-transfer schemes”. An example of a predicate-transfer scheme is appeal to a source of information, where the common subject is the proposition asserted by the source and there is a transfer from the predicate of being asserted by the source to the predicate of being correct. An example of a referent-transfer scheme is argument by analogy, where the common predicate is the queried property and there is a transfer from the analogue to the target.

Predicate-transfer schemes have the following general form:

<Subject> <1>.
 \therefore <Subject> <2>.

And we can easily make explicit the inference-licensing defeasible covering generalization:

Every {one / thing} that <1> <2>.

For example, the general scheme for appeal to a source of information becomes:

That *p* is asserted by source *S*.
 Everything that is asserted by source *S* is correct.
 \therefore that *p* is correct.

A little bit stilted, but one can see clearly when one puts it into the logic bridge or Laronge’s template that the argument is valid. Of course, the major premiss needs qualification, and that is the function of the critical questions associated with the scheme or its sub-types, the answers to which questions show up as supporting assumptions in Laronge’s visualization of the argument structure. I will come back to the incorporation of critical questions when I come to discuss assumptions.

Referent-transfer schemes have the following general form:

<1> <2>.
 \therefore <Subject> <2>.

In principle, one can put such a scheme into the form of a categorical syllogism by regimenting the stated major premiss and making the minor premiss explicit, as follows:

<Subject> is <1>.

In practice, however, some fine-tuning may be required. For example, the general scheme for argument by analogy is:

Analogue *a* has queried property *Q*.
 \therefore target *t* has queried property *Q*.

To get the form of an argument by analogy, we need to prefix the stated premiss by ‘everything that is like’ rather than ‘everything that is’. The minor premiss then emerges quite naturally, as follows:

Target *t* is like analogue *a*.
 Everything that is like analogue *a* has queried property *Q*.
 \therefore target *t* has queried property *Q*.

Alternatively, one could take queried property *Q* as the common subject, with a transfer from the

predicate ‘belongs to analogue *a*’ to the predicate ‘belongs to target *t*’, and an implicit major premiss that everything that belongs to analogue *a* belongs to target *t*—a generalization whose scope would have to be qualified in terms of the range of variables to which the assumed similarities between analogue and target are relevant.

Like argument from analogy, statistical generalization can be regimented as a referent-transfer scheme, as follows:

Sample *s* from universe *u* has a frequency *n* of property F.

∴ universe *u* has a frequency *n* of property F.

Intuitively, the assumption that would license such an inference is that sample *s* is representative of universe *u* with respect to the frequency of occurrence in it of property F. (This assumption is a covering generalization of such an inference, generalizing over *n*.) Since the common element over which we wish to generalize is not the common predicate but an embedded numeral, it seems more reasonable to regiment statistical generalization as a predicate-transfer scheme, as follows:

n is the frequency of property F in sample *s* from universe *u*.

∴ *n* is the frequency of property F in universe *u*.

With this regimentation, the unstated inference-licensing major premiss is as follows:

Everything that is the frequency of property F in sample *s* from universe *u* is the frequency of property F in universe *u*.

And that means exactly the same as the intuitive assumption that the sample is representative of the universe with respect to the frequency of occurrence of property F. The believability of this premiss would have to be assessed on the basis of such factors as how the sample was selected from the universe, whether it corresponds in relevant respects to the universe, the variability in the universe with respect to the variable of which property F is a value, and the size of the sample.

Regimenting argument schemes into one-premiss forms of argument in which premiss and conclusion are in subject-predicate form and either share a subject or share a predicate provides a basis for putting them into a natural-sounding categorical syllogism and displaying them in a DCIT logic bridge. The three examples discussed suggest that it will be more reasonable to regiment argument schemes as predicate-transfer schemes than as referent-transfer schemes.

4. CERTAINTY

Laronge defines the degree of certainty of a premiss as how believable an addressee finds it. I am however a little unclear as to what it means for a person to be 90% certain or 10% certain of something. If believability here functions as a subjective probability function, we might suppose that a premiss that someone finds 100% believable is one that the person would be prepared to give any odds in a bet with someone that it is true (assuming that the person is a betting person). Someone who finds it 90% believable would be ready to give odds up to 9 to 1 in a bet that the premiss is true. If they find it 50% believable, then they would be ready to bet 50-50 that the premiss is true. On that interpretation, 50% certainty amounts to being totally unsure whether the premiss is true or not. 0% certainty would be total certainty that the premiss is false. If this

interpretation is correct, and if rational degrees of subjective certainty conform to the probability calculus, then the rational degree of certainty in a conclusion, assuming that the degree of certainty of each premiss is independent of the degree of certainty of each other premiss, is the product of the degrees of certainty of each premiss. Hence the principle that Laronge enunciates, that the degree of certainty associated with an argument is only as great as that of the weakest link in the chain of reasoning leading to the conclusion, needs to be modified to the principle that it is *no greater than* the degree of certainty of the weakest link in the chain of reasoning leading to the conclusion. It is important to note that this degree of certainty is relative to the argument advanced for the conclusion. The addressee might have other reasons that would make them more certain of the conclusion, and this greater certainty would not rationally be diminished by the fact that the presented argument confers a lesser degree of certainty on it. On the other hand, if the addressee's other reasons for believing the conclusion are even weaker than those presented by the current argument, the lesser certainty conferred by those other reasons should not diminish the addressee's degree of confidence that the conclusion is true. (An exception to these two independence principles could arise if there is some incoherence in the degrees of certainty that the addressee attaches to the premisses in the various reasons that they have for believing or not believing the conclusion.)

5. ASSUMPTIONS

We need some clarification of what is meant by an assumption. Laronge makes clear that assumptions supporting a premiss are not DCIT arguments linking the subject of the premiss to its conclusion. If a premiss that needs support gets it in the form of a DCIT argument, then the supporting premisses replace it, as in the example of the student replacing the queried premiss that the President was born in Hawaii with two premisses from which it follows: the President has a Hawaiian birth certificate, everyone that has a Hawaiian birth certificate was born in Hawaii. Assumptions however are not sequences of statements that link the subject of the supported premiss to its predicate. They offer support in some other way, a way that to me at least is unclear. Further, it is unclear what is the difference between a necessary and an ancillary assumption.

As an example of a necessary assumption, supporting the premiss that anyone who was born in Hawaii is a natural-born U.S. citizen, Laronge gives the assumption that the person was born when Hawaii was a state or U.S. territory. This "assumption" looks like a proviso: a person born in Hawaii is a natural-born U.S. citizen provided that the person was born when Hawaii was a state or U.S. territory. In his course, in the lecture on assumptions, Laronge says that you are assuming that the person was born when Hawaii was a state or U.S. territory, because if not, if it was prior to that time, the person would not be a natural-born U.S. citizen. So the assumption is a necessary condition for the applicability of the predicate to anyone to whom the subject applies. But it must also be a sufficient condition, since its sufficiency is what one needs for the premiss to be true. One wonders why this proviso was not just built into the subject: anyone who was born in Hawaii when it was a state or U.S. territory is a natural-born U.S. citizen. Such an expansion would of course require a corresponding expansion of the predicate in the previous premiss: The President was born in Hawaii when it was a state or U.S. territory. But that is surely

as it should be. Since the second premiss requires the expansion in order to be correct, the first premiss needs to have the corresponding expansion in order to be properly linked to it. There is of course a certain amount of pedantry in qualifying the middle term in this way, since Hawaii has been a state or U.S. territory since 1898 and nobody alive at the time of the birther debate was born as long ago as 1898—but perhaps the pedantry is necessary to forestall someone who might suggest that Barack Obama was at least 110 years old when he was first inaugurated as the President at the beginning of the year 2009.

In his course Laronge explains ancillary assumptions as assumptions that contribute to the support but are not absolutely necessary. As an ancillary assumption supporting the premiss that anyone who was born in Hawaii is a natural born U.S. citizen, he provides the assumption that the person was born in 1961 (as Barack Obama was). This assumption is one way in which one can meet the requirement that the date of birth be subsequent to Hawaii's becoming a U.S. territory. Again, one wonders why the assumption cannot be built into the subject term of the major premiss of this argument. For example, to make everything explicit, one might reframe the argument that Laronge is discussing as follows:

The President was born in Hawaii in 1961.

Everyone who was born in Hawaii in 1961 was born in Hawaii when it was a state.

Everyone who was born in Hawaii when it was a state is a natural born U.S. citizen.

∴ The President is a natural-born U.S. citizen.

The function of the assumptions in these two examples is to narrow the scope of a universal generalization so that it covers only instances in which the predicate belongs to the subject. The virtue of building the assumptions explicitly into the premisses is that both the truth of the premisses and the logic of the inference become quite obvious, at least to those with the background knowledge required to evaluate the premisses. A disadvantage is that the premisses become internally more complicated and cluttered. Further, one might not think immediately of the scope restrictions required to make one's universal generalizations true. One could accommodate the latter difficulty, however, by introducing qualifications as one considers the credibility of the premisses in the first draft of one's argument. If one notices a proviso, one can build it into the content of the premiss. So one could envisage transformations like the following:

Version 1: The President was born in Hawaii. Everyone who was born in Hawaii is a natural born U.S. citizen. So the President is a natural born U.S. citizen.

Proviso for the second premiss: The person was born when Hawaii was a state or U.S. territory.

Version 2: The President was born in Hawaii when Hawaii was a state or U.S. territory. Everyone who was born in Hawaii when Hawaii was a state or U.S. territory is a natural born U.S. citizen. So the President is a natural born U.S. citizen.

Response to a possible challenge to the first premiss: The president was born in Hawaii in 1961. Hawaii became a state in 1959.

Version 3: The President was born in Hawaii in 1961. Everyone who was born in Hawaii in 1961 was born in Hawaii when Hawaii was a state. Everyone who was born in Hawaii when Hawaii was a state is a natural born U.S. citizen. So the President is a natural born U.S. citizen.

An advantage of this way of treating “assumptions” is that it leaves less mysterious the nature of

the support provided by assumptions and fits all the components of an argument into the logic bridge, where checking validity is quite mechanical.

Whether this strategy works for all assumptions, necessary or ancillary, depends on whether they all work to restrict the scope of a universal generalization for which they are offered as support. In particular, we need to determine whether that is the way the sets of assumptions work that Laronge gets for argument schemes from their associated sets of critical questions. Let us consider one of Laronge's examples of such a set of assumptions. The premiss that one who was born in Hawaii according to the witness was born in Hawaii has as its assumptions seven generic characteristics of a reliable witness: personal knowledge, enough focused attention, necessary perceptual and cognitive capacities to understand, adequate memory capabilities, sufficient level of certainty, lack of personal bias, intent to be truthful. Note that the witness might have these characteristics for some individuals in the class but not others—for Barack Obama for example, but not for some other person who the witness says was born in Hawaii. Here the characteristics function as provisos, conditions under which someone who the witness says was born in Hawaii was born in Hawaii. In this case they are jointly sufficient to make the statement highly probable, although the absence of one or more of these provisos does not show that the premiss is false, as was the case with the necessary assumption offered in support of the premiss that one who was born in Hawaii is a natural born U.S. citizen. In his lecture on assumption sets, Laronge says that, if any one of the seven supporting assumptions is false, then the whole support collapses and the load of certainty *may* not make it to the finish. Even if the collapse of support reduces the degree of certainty conveyed by this argument quite substantially, it does not show that the conclusion is false, merely that it is inadequately supported.

It seems quite feasible, if cumbersome, to build the seven assumptions into the premisses of the categorical syllogism. If we take my suggestion for the regimentation of an appeal to a source of information, we get the following sequence of versions of Laronge's example:

Version 1: That the President was born in Hawaii is asserted by the witness; everything that is asserted by the witness is correct; so that the President was born in Hawaii is correct.

Proviso for the second premiss: The witness had personal knowledge of what the witness asserted.

Version 2: That the President was born in Hawaii is asserted by the witness on the basis of personal knowledge; everything that is asserted by the witness on the basis of personal knowledge is correct; so that the President was born in Hawaii is correct.

And so on.

It may turn out to be too cumbersome to get rid of the supports for the premisses in the logic bridge and build them instead into the content of the premisses themselves. But, if I am correct about the role of the assumptions in narrowing the scope of a universal generalization to which they are attached, it would be useful to make this role explicit. It would then become clear that the vertical lines connecting assumptions to the premiss that they support do not hold by some unstated mysterious logic not the same as DCIT, but that they indicate restrictions on the domain of the universal quantifier in the supported premiss.

As a corollary to this discussion, we might note that the critical questions that concern the

applicability and appropriateness of an argument scheme have the effect of exploring whether an instance under discussion falls within the class within which the conclusion of the scheme follows from its operative premiss. And we should heed Laronge's caution that the "critical questions" that need to be raised about a particular argument are not necessarily the same as the stereotypical list associated with a scheme to which the argument seems to belong. Arguments vary, and do not always exactly fit an accepted scheme. Further, in the case of most sets of critical questions associated with an argument scheme, nobody has proved that the questions are individually necessary and jointly sufficient to ensure the correct application of the scheme.

6. SUMMARY

Joseph Laronge has developed a generally applicable method for creating valid arguments using the logic of what he calls "defeasible class-inclusion transitivity" (DCIT), essentially chained categorical universal affirmative statements. To represent the validity of such arguments, he has developed a powerful visualization tool, the "logic bridge", and its isomorphic template. The tool can be used to calculate the degree of subjective certainty that such an argument confers on its conclusion. We would do well to put aside any initial scepticism we might feel about how many premisses and conclusions can be regimented into universal affirmative categorical syllogisms, and instead explore how far we can push such a powerful visual tool. There is reason to think that it can be applied to any recognized argument scheme. The level of subjective certainty provided by a DCIT argument seems to be conceptualizable as a subjective probability function conforming to the Kolmogorov axioms of the probability calculus. The assumptions that Laronge includes as support for the premisses of a DCIT argument seem to have the role of restricting the scope of a universal generalization that they support. In principle, such restrictions could be made explicit in the content of the premiss, thus making explicit the nature of the "support" that they provide. There is much to learn from Laronge's approach.