On Caesar=0

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¶ 1 Thanks!

I will present joint work with Eric Johannesson, who is sitting here next to me. While I will, at least initially, be the one to talk, Eric is the one who has done the hard work. I was the one who brought up the idea that the there might be no problem at all with having Caesar = 0, and then we jointly went from there---with, I reiterate, Eric doing the hard work.

¶ 2 I am Anders Lundstedt. The initials ‘E.V.’ is not me trying to be fancy or anything, but simply a consequence of me trying to distinguish myself from another scholar competing for Google results. While now dead, that scholar's name is thus also ‘Anders Lundstedt’, but his middle name is ‘Vilhelm’ and he went by ‘Vilhelm Lundstedt’. Ironically, my initial ‘V’ is for ‘Vilhelm’.

¶ 3 <u>SLIDE:</u> abstract

¶ 4 These asides aside, I will present work of ours inspired by Frege's dissatisfaction with his logicist project not ruling out the identification of Julius Caesar with the number zero.

¶ 5 So some background to this talk, and an outline of it.

- Frege had his logicist project, and one problem he encountered is that his project did not rule out that Caesar=0. We do not think that is a problem at all, but out of curiosity we have anyway explored the question of whether Caesar=0.
- We have arrived at the, perhaps surprising, conclusion that it is perfectly consistent with our best theories of the world that Caesar=0.
- More generally, we may identify as many abstract objects with concrete objects as there are concrete objects.

¶ 6 Here is the solution to Frege's problem.

¶ 7 <u>SLIDE:</u> Quine on arithmetic

> The subtle point is that any progression will serve as a version of number so long and only so long as we stick to one and the same progression. Arithmetic is, in this sense, all there is to number: there is no saying absolutely what the numbers are; there is only arithmetic.
> [Quine]

¶ 8 <u>1 minute of silence</u>

¶ 9 I paused for some attempt at dramatic effect, but primarily I paused to give you time to read and reflect on Quine's words---instead of you having to do that while disturbed by me reading them out loud. Nonetheless---so as to not stray to afar from tradition---I will now read them for you. Quine writes:

> The subtle point is that any progression will serve as a version of number so long and only so long as we stick to one and the same progression. Arithmetic is, in this sense, all there is to number: there is no saying absolutely what the numbers are; there is only arithmetic.

¶ 10 By the way, I doubt that Quine was first to make this observation, and it has probably been independently made by many others. In any case, what matters is that the observation is true.

¶ 11 <u>SLIDE:</u> Expanding on Quine's observation

¶ 12 Alright, we could perhaps already conclude: as natural numbers any progression suffices---for example, one starting with Julius Caesar; or one starting with any object whatsoever, for that matter. But a statement phrased in natural language might sound true while none of its explications are. Thus we need to continue. To expand before going into slightly technical matters:

- Science needs natural numbers, in one form or another.
- The only requirement science puts on natural numbers is that they form a progression.
- That progression may start with Julius Caesar.

- That progression may just as well start with any other object.

- In particular, that progression may start with a “postulated” object that is not identified with any other already postulated or conceived object. This is the default approach: postulate a number 0, not presumed identical to any other object in one's already-existing ontology, and proceed from there. (By the way, I encourage you to ask me why I made air scare quotes when I said ‘postulated’.)

¶ 13 <u>SLIDE:</u> abstract and concrete objects

¶ 14 Many in philosophy want to make some kind of “fundamental” distinction between “abstract” objects---abstract objects commonly then exemplified by numbers---and “concrete” objects---concrete objects then exemplified by for example tables, chairs and Roman dictators.

¶ 15 Why assume that? There is certainly a common-sense distinction between, say, numbers and tables. To take some examples:

- We may find ourselves having reason to believe that there is a table in our field of vision. It seems absurd that we would ever believe that the number 0 is in our field of vision.

- We ascribe weights to tables and chairs, and utterances to Roman dictators. It seems absurd to ascribe such things to numbers.

- Caesar crossed the Rubicon. It seems absurd to say that the number 0 crossed the Rubicon.

¶ 16 In agreement with common-sense, we do not believe that Caesar = 0. Neither do we believe that Caesar ≠ 0. Our latter lack of belief probably seems unintuitive, and we agree that it does, but committing to, and only to, our best theories of the world, we cannot rule out that Caesar ≠ 0.

- None of our best theories proves that Caesar = 0.

- None of our best theories proves that Caesar ≠ 0.

¶ 17 <u>SLIDE:</u> what about the other numbers?

¶ 18 So it is consistent with each of our best theories of the world that Caesar = 0. What about identifying other abstract objects with concrete objects? Take the number 1 for example. An easy observation is that if we identify Caesar with 0 then we cannot also identify Caesar with 1---doing so would give 0 = 1 and thus a contradictory theory. But there are concrete objects other than Caesar. It is consistent---again, with our best theories of the world---to, for example, identify 0 with Caesar and 1 with Cicero.

How far can we go? Obviously, for consistency any two distinct abstract objects must be pair-wise identified with two distinct concrete objects. Thus the number of abstract objects that can be simultaneously identified with concrete objects is equal to the number of concrete objects. There are at least countably infinitely many abstract objects, since there are countably infinitely many natural numbers.

We leave it to the specialists in the more practical sciences to determine how many concrete objects there are.

¶ 19 <u>SLIDE:</u> Consistency and empirical equivalence

¶ 20 <u>Read the first two points.</u>

¶ 21 To expand a bit on this, suppose we have the following.

T = one of our best theories of the world

$T \nvdash P$

where

P = an as of yet undecided empirical statement

and

(!) $T \vdash \text{Caesar}=0 \rightarrow P$.

Then adding the statement that Caesar=0 does have empirical consequences---empirical consequences that may be false even, but in any case are unjustified.

¶ 22 <u>Read the last point.</u>

¶ 23 This is quite the understatement though. It does seem absurd that any of our best theories has empirical consequences from Casear=0.

¶ 24 Here we could stop. All of our important points have been made. How are we on time?