

## Typing

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No, not sitting at a typewriter, but classifying according to categories or types. Sifting through what we know about an object and drawing implications that may help us classify it. This may in turn unlock more information and implications suggesting how we should act toward the object. The very fact that I must explain what I mean by "typing" is part of the problem I plan to attack here. But let me first indicate why I think this may be worth the attention of informal logicians. In describing "The New Logic Course" Ralph Johnson stated that "an informal logic course should contain a modicum of formal logic. But just how much and just what sort I do not profess to know." [1] I am suggesting syllogistic reasoning as a candidate for consideration, syllogistic reasoning viewed as normative guidance for ordinary categorizing or typing rather than as the model argument form of traditional formal logic.

True enough, the quantification schemata developed in modern symbolic logic encompass a wide range of class inferences, and this range comprises the syllogism as one of its parts. This may indeed render the syllogism theoretically superfluous. Bertrand Russell eagerly tossed it aside as unimportant. [2] Some recent logic texts begrudge it a few pages in deference to its historical importance. [3] But notice that even though the Sheffer function [4] rendered all but two of the five commonly used connectors (e.g. conjunction, disjunction) of propositional logic superfluous, they all survived and flourished because they were much easier to work

with in handling the material logic is there to handle. The case I want to make for the syllogism is a similar one of providing practical advantages, whether it is theoretically necessary or not.

Frankly, if only a considerable number of students would master first-order predicate logic and allot it a prominent role in their thinking, I would not pursue this matter. But they will not. It is too easy to blame this on the students—decades of SAT slippage, only bottoming out in 1982, waning Protestant work ethic, etc. One of the most heartening traits of informal logicians is that they resist the easy explanation for the much harder one advocated by the Delphic Oracle and Socrates, *gnothi sauton* (know yourself). We are united by the conviction that symbolic logic and formal logic as they are commonly taught do not well serve the purpose of an introductory logic course as part of a general education requirement of a curriculum.

One very important and obvious advantage of syllogistic reasoning in this connection is that it can keep reasoning about class membership relations in close proximity to ordinary language. Convenience, efficiency, and precision typically justify introducing symbols. But consider this a moment. Most of our students spoke English five years ago and will be speaking it five years hence. None used logical symbols five years ago, and very few will be using them five years hence. If you could give a snap quiz a few weeks after your final exam, you would probably find that most students had already forgotten the

symbols. So any symbols used in the general education requirement logic course ought to have strong justification.

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Now let me risk your outrage by advancing a thesis that I do not even know how to go about proving. It is that reasoning about class-membership relations can help people master some of the practical demands of life. Further, I believe that every normal person learns some such reasoning by trial and error, but this occurs so early in life that the learning process itself is forgotten. So people are usually as unaware that their thinking involves typing or categorizing as they are that they are continually breathing air. People are made aware that they breathe air when they need it but can't get it (suffocation), or when they have been breathing polluted or noxious air (dizziness, nausea). Similarly we can become aware of our typing or categorizing when we need categorizations we cannot find, or when we discover our own category mistakes or have them brought to our attention.

First, let us glance at an example of a health-care professional wrestling with a knotty problem that she herself views as one of category difficulties. Here in her own words[5] is her problem arranging transportation to get a poor woman with pregnancy complications into the clinic for medical attention:

(It seems that) this patient doesn't fit into the right classification. They don't have transportation services for those classified as prenatal. The poor woman just couldn't get transportation. Buses cost a lot and they live a long ways away. We have a driver at the Health Department who drives TB patients, so I thought I would get this driver to go out and pick up this prenatal woman. Oftentimes I would see the driver just sitting on the bench with nothing to do. I made all arrangements and filled out all the forms and went and talked to the community worker who drives patients back and forth, and she said, "Sorry, I can't do it; I can only

transport (a particular classification of) patients." The driver was sitting there knitting, not doing a thing; but still she couldn't go out and pick up this woman. I explained that she really needs the transportation and "if you aren't busy" ... "I'm sorry; they have to be in a certain category." I talked to everybody to see if I could get some help for this woman. The woman didn't wear the right label, so her need was just pushed aside and ignored.

Putting aside the complexities of this case, and possibilities of interpretation obvious to many of you, let us simply note how reasoning about categories could help solve this problem. One might focus on the area where this woman's symptoms overlap with typical TB symptoms, say difficulty breathing or chest pains, then get her classified and transported as a "symptoms of TB" patient.

The frustration of this health-care professional suggests that this case was out of the ordinary. This in turn implies that the categorization of patients relative to facilities usually functioned adequately, or that typing as reasoning about class-membership relations was meeting the demands.

Now let us glance at stereotypes. Stereotypes are categorizations that are totally (or partially but significantly) erroneous, and that are not corrected but held on to tightly in the face of contrary experience or counterexamples. They tend to arise wherever different people interact. There are racial ones (nigger, honky), ethnic (wop, chink), sexual (ass, prick), and other.[6] On one interpretation, there are both good stereotypes and bad stereotypes, so we should encourage the good and discourage the bad. But this conflicts with usage of "stereotype," which suggests that all stereotypes are bad. And usage seems the better guide in this case. Since the stereotype is a misleading categorization held rigidly despite contrary experience, its good counterpart is categorization that is sufficiently correct to be adequate to demands. Correct typing is the opposite of stereotyping.

As the stereotype is unthinking, so adequate typing depends on sound reasoning about class-membership relations. Confrontation with counterexamples is the first step toward correcting a stereotype. But often it isn't enough—the stereotyper must be brought to realize that he *is* confronting a counterexample. For instance, at one time many white Americans believed that all black Americans were lazy. They could watch such energetic, hustling black athletes on TV as Jackie Robinson or Wilt Chamberlain, yet still believe that all blacks were lazy. Bringing them to realize that these and others were indeed counterexamples was an important step in breaking up a stereotype. Some persist in believing that all blacks are lazy. More than counterexamples is needed to combat such deeply held prejudices. The mental flexibility that prevents or corrects stereotypes does so by sifting through our categorizations and beliefs and rendering them more adequate to our experience. So any areas where we are relatively free of stereotypes attest to some amount of adequate reasoning about types.

My final piece of indirect evidence is from a writer who is no stranger to anyone here:

A foreigner visiting Oxford or Cambridge for the first time is shown a number of colleges, libraries, playing fields, museums, scientific departments and administrative offices. He then asks: "But where is the University? I have seen where the members of the colleges live, where the Registrar works, where the scientists experiment and the rest. But I have not yet seen the University in which reside and work the members of your University." It has then to be explained to him that the University is not another collateral institution ... The University is just the way in which all that he has already seen is organized. When they are seen and when their coordination is understood, the University has been seen. ... He was mistakenly allocating the University to the same category as that to which the other institutions belong.[7]

The visitor commits what Ryle calls a "category mistake." He expects to view the University just as he's viewed the lecture halls, scientific laboratories, and residence halls. The University comprises all this and more, and the visitor's failure to grasp this constitutes his category mistake.

But Professor Ryle's visitor is untypical. Several people I've shown around our far more modest campus tend to say something like this: "Yes, I've admired your low-rise lecture halls scattered among stands of pine and your library over behind the dogwood and crabapple. Despite the somewhat barren administration building, I'd say you have a rather attractive college." Again the occasional category mistake draws our attention to the many more occasions where categories are used correctly. Not only our words but our actions too attest to correct category use, as when going to mail a letter we stuff it in the mailbox rather than the litter receptacle.

So unmet category needs, stereotypes, and category mistakes all constitute important indirect evidence of a great area where reasoning about class-membership relations is meeting demands. This is the area where category needs are met rather than unmet, where we have types instead of stereotypes, and where there is correct category use rather than category mistakes.

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It is time now to illustrate as briefly as feasible how syllogistic reasoning might aid someone in responding to a situation of everyday life. At the same time I would raise a question about the relation of the syllogism to the extended argument. Since Howard Kahane broke the path by insisting on attention to extended arguments,[8] most informal logicians have followed his lead. The textbooks of Stephen Thomas, Johnson and Blair, and Michael Scriven[9] all devote special attention to extended arguments. Focus on the extended argument gets us from "those in-

vented and docile creatures,"[10] the concocted and artificial argument snippets that have been the logic teacher's stock in trade until quite recently, to a logic of use to someone in meeting challenges of real life.

Of course a syllogism may be stretched to as extended an argument as one pleases by means of prosyllogisms, episylogisms, parasyllogisms and the like, but this seems as little relevant as Leibniz's syllogistic virtuosity in attempting to justify the ways of God to man. [11] As important as the extended argument is, may we not discern around its edges another factor of significance for getting logic out of the textbook and out of the classroom into life? I refer to the attention given to the *context* of the argument, the situation in which it actually arose. My impression is that *all* of the informal logic texts cited earlier devote more attention to the context of an argument than do traditional texts — Johnson and Blair may devote most. We may want to supplement the extended argument with a *tranche de vie* approach where we accept the burden of showing how an argument has or could figure in a situation our students might encounter.

Here in any event is my *tranche de vie*. We are vacationing for a few days in the West Virginia Appalachians, and just now turning off the main highway to reach our motel still a mile or two distant. We travel a narrow road through wooded areas and green, grassy clearings, noticing that it would be a nice place for a walk near the motel. Fifty or sixty feet to the left of the road a wild animal about 18 inches tall is observed sitting on its haunches. Partly because of our two young children, the question arises whether on a walk there would be danger of being attacked by the animal.

Here now are excerpts from the reasoning that provided our answer, excerpts comprising more than just the syllogism. The first question is whether the animal is a member of the cat family, whose members can attack human. But it has none of the features of wildcats (which we know only from visiting zoos), nor does the posture of sitting

on haunches appear typical of a wildcat.

All wildcats are animals with certain features (e.g. erect, pointed ears);

No observed animal has these features;

So no observed animal is a wildcat.

But wait a moment. We've observed only *one* animal, yet in our syllogism we are already speaking of a group or class of animals. Isn't that illegitimate? It does need explaining. Even though we've observed only one such animal, we assume there may be other similar ones in the vicinity. The assumption is based on past experience and reasoning by inductive analogy. In the past when we walked through a wilderness we would see first one squirrel, then several others; first one deer, then others.

On many occasions in the woods we've seen first one wild animal then several others of the same kind;

On this occasion we've seen one wild animal;

So if we continue here we will probably sight several others.

There is practical reason for this assumption also. If we did not assume there might be other similar animals in the vicinity, our concern could cease. We could simply strike out in a different direction on our walk, or steer a wide path around the area where the animal was sighted.

From here, we reason by elimination. Seen imperfectly by setting sun, the observed animal seems smaller than a raccoon and appears to lack its distinctive color pattern also. Nor does it have the shape of an opossum, and its fur doesn't stick out like an opossum's does. Our possibilities are narrowed down to these.

The observed animal is either a groundhog or a beaver.

Beavers are animals usually found near water;

None of the observed animals are near water;

So none of the observed animals are beavers.

We notice that there is no stream or river nearby, which on the basis of the above syllogism inclines us toward the groundhog (or woodchuck, as it is sometimes called). A look back as we drive away reveals that this animal lacks the distinctive broad, thick tail of the beaver.

Beavers are animals with broad, thick tails;  
None of the observed animals have broad, thick tails;  
Hence none of the observed animals are beavers.

This allows us to complete our argument by elimination.

The observed animal is either a groundhog or a beaver;  
It is not a beaver;  
So it must be a groundhog.

We know the groundhog to be a timid, mild-mannered creature, quite unlikely to attack humans, so we can take our walk with our minds at ease. Before we leave this *tranche de vie*, let me slice the same material from a different angle. The reasoning above occupied a few seconds, and during this time anyone present in the car would have heard something like this.

"Look! Look over there." (points to the left)  
"Oh! Wonder what it is."  
"Looks like a beaver."  
"But look. It doesn't have a tail like a beaver's."  
"Might be a groundhog."  
"Look at him. He just sits there looking at us. Doesn't even run away."

One more comment may be helpful before we leave this example. We may count it among the more severe shortcomings of much teaching of both traditional and symbolic logic that it neglects to build models for the student—how he is to be challenged, why he should learn what we teach him, and what he is expected to be able to do with it. As informal logicians we confront the student with an argument

and challenge him to decide whether it is strong or weak. The above example suggests another model. Confront the student with a problem and challenge him to marshal his logical resources to solve it. Then help him identify his inferences and decide which are strong and which weak. Life will continually confront him with similar problems, and the logic teacher who imparts skills useful in solving them cannot be too far off target.

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Why does the perspective suggested by this model tend to get overlooked? We might say of the person thinking silently to himself that he was drawing inferences, but we would not say that he was constructing arguments. We tend to distinguish inferring as a subjective process of interest to psychology from constructing arguments as an objective process of interest to logic. (A fresh look at this distinction may be helpful. It could be that when one reasons to convince others we call it "argument," and when one reasons to convince himself we call it "inference.")

Why does philosophy offer so little toward meeting everyday demands on reasoning skills? The quest for a perfect, all-encompassing logical system has beckoned many in a different direction, even though—as Professor Hintikka has so forcefully shown at this conference—the work of Gödel has shown it to be impossible to attain.

Another factor may be the wide influence of mechanical models of the mind. Ryle is by no means blameless in this, despite his signal services to informal logic.[12] The category mistake he was most concerned to combat was the "ghost in the machine," the invented immaterial agent for mental acts we ascribe on the basis of our observations of bodily behavior. One motive, he thought, for inventing such an immaterial agent was so that some aspect of humans might survive death. But if the ghost doesn't exist, then all

we have left is the machine. Ryle doesn't shrink from this view, and even though he didn't want it called "philosophical behaviorism," the name is fitting. There is a class intersection at this point with the behaviorism of B.F. Skinner and other psychologists. For them, all human behavior is at bottom nothing but more or less complex causally controlled stimulus-response patterns.

Once you have a theoretical justification for a mechanical view, the analogy with the computer is very tempting. Computer theorists like Dean Wooldrige[13] elaborate it. He holds that human intelligence does not differ in principle from artificial intelligence, that the stimulus-reponse patterns of the sensory and motor nervous systems operate analogously to the inputs and outputs of computers, and that the brain itself is but a complex switching mechanism quite similar to a digital computer. Their only difference is one of complexity, as when you compare the simple on-off of a computer switch with the complex electro-chemical information-processing of the neuron.

*Time* magazine's choice of a computer as "Man of the Year" for 1982 is not a category mistake, but it does attest to wide influence of the mechanical view. It gets this wide currency not because any appreciable number of reasonably intelligent people find it adequate. Dreyfus for example has written well on the differentia of humans and computers.[14] The mechanical view gets its currency by default. What other readily intelligible and workable view of the mind's operations is there? Yet the theory that the mind responds automatically to stimuli denies the conscious, deliberate influence we must be able to exert on our own mental processes if logic is even to be possible as a normative discipline. For what appears automatic and controlled by causal law to behaviorist and computer theorist is really only mental habits that can be brought to light, checked out by logic, and modified if desired.

Another reason for philosophy's paucity of help with everyday reasoning

skills may be that it is specially difficult to keep this need in sharp focus. Notice how in Plato's early dialogues Socrates excels at seeking clear categories with sharp edges. This whets our interest for Plato's investigation of techniques of categorization in *The Statesman*. [15] Here the Eleatic Stranger advises, "We must only divide where there is real cleavage. ("Real cleavage" would be "natural kind" in today's terms.) Breaking off small pieces at the edges is unwise.... It is dangerous, Socrates, to chop reality up into small portions. It is always safer to go down the middle to make our cuts; the real cleavages among the forms are more likely to be found there." But Plato's focus shifts to technique for the sake of technique, and deducing reality from the Forms, with the result that even sympathetic readers find this work dry logic-chopping. Perhaps Plato's definition of man as the featherless biped did merit the *refutatio per naturalium* of Diogenes the Cynic, who visited the Academy brandishing a plucked fowl. [16]

With brute force we can slice reality where we will. But if our categories are to serve well, we need both keen vision and a deft stroke. This ideal is cross-cultural, as a pungent tale by the Chinese sage Chuang Tzu reveals. He cites a butcher whose cleaver never needed sharpening though he used it continually in his work for twenty years. Asked for his secret, he replied, "Between the bones of every joint there is always some space, otherwise there could be no movement. By seeking out this space and passing through it my cleaver lays wide the bones without touching them." [17]

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Finally, in the spirit of good old hack-and-chop, let-the-pieces-fall-where-they-may butchery, let me approach the syllogism as it is currently taught. The goal appears to be to remove it as far from real-life reasoning as possible. Actually it is taught as

the core of traditional logic, and this means with stress on formal features so as to convey the idea of logical form. To display the irrelevance of content, the student is assaulted with the mortality of Socrates or some utter nonsense such as this.

No misers are unselfish people;  
All people who save eggshells  
are misers;  
Thus no unselfish people are people  
who save eggshells.

What many students learn from this is not so much the irrelevance of content as the irrelevance of logic.

Traditional logic has 256 syllogistic forms,[18] and instruction typically assumes they are all of equal value. How many of the 256 is the educated person ever likely to encounter or need? We are likely to find that any test of validity is best chosen to cover all the forms. But we could choose our examples for teaching from the more common valid and invalid forms. And we could choose them to illustrate syllogistic reasoning meeting practical demands rather than to illustrate form. Thus perhaps an *informal* rather than a formal approach to the syllogism.

Categorical statements are probably still needed, though some strictness of interpretation may be superfluous.[19] Attention should be devoted to such ordinary-language quantifiers as "only" and "most". Immediate inference is usually taught ancillary to the syllogism. Conversion may be best taught on its own merit first.[20] The mind may have a native trend toward symmetry so that once people discover that E and I statements are convertible, they assume that A and O are convertible, too. Contraposition seems useless. I am unsure about obversion. It is contrived from the standpoint of ordinary language, and it often misleads us seriously in the conceptualization of material. But it may reveal something important about how double negation affects truth value as currently interpreted.

The square of opposition is now

taught along with the syllogism and to illustrate the existential assumption. From the vantage point of informal logic there is probably more harm than good in this. The student learns that a contradiction can occur only between a universal and a particular statement. Then he never encounters such a contradiction outside his logic class, and soon forgets it. Some experimenting is needed here. Ideally a student would leave an informal logic course well equipped to deal with contradictions, implications, and questions of consistency wherever he encountered them. Very often indeed this would *not* be in the context of argument or inference. If we don't do this work, do you think the student is going to learn it anywhere else?

Unless your logic course aspires to first-order predicate logic, treating the existential assumption is probably useless baggage. The abstract theoretical modeling that needs it is simply too distant from most common demands on reasoning skills. Most people need reasoning skills to cope with what they've experienced, are experiencing, or are likely to experience. So the question may be whether your students report frequent encounters with square circles, unicorns, griffins, baldheaded kings of France, and the like.

If not, then they may be better off being taught to reason about what they can possibly experience. In very many practical situations, "all" and "no" are equivalent to "any that I am likely to encounter." Learning to adjust the domain of quantifiers from immediate surroundings to state or nation, or to the entire earth may provide valuable practice in switching and adjusting perspectives. The problem of universal statements and the empty domain is quite peripheral for informal logic. Solutions permitting the above interpretation would be Kneale's of putting the empty domain aside,[21] or Angell's of predicating existence when clarification is needed.[22]

Say now that the whole point of putting material into syllogistic form is to test inferences for validity. Our goals

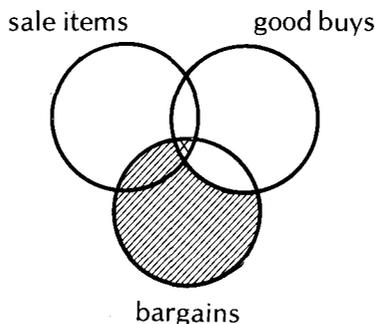
are simplicity, ease of mastery, and ease of application to ordinary-language material. Which test will we choose? Probably some version of rules or diagrams. As they are commonly taught, the rules involve both the existential assumption and the distribution of terms. You can of course have your students memorize which terms are distributed. But it will probably cost you a good chunk of classroom time to get a majority of them to understand distribution. And unnecessary memorization is contrary to the spirit of logic.

Venn diagrams avoid both pitfalls, and offer one advantage. All students doodle during lectures, and Venn diagrams can be taught as an extension of doodling technique.

How many of the commonly taught formal features of the syllogism can you do away with yet still test all forms for validity by Venn diagram? The answer may surprise you. It did me. We start with categorical statements. First we must distinguish conclusion from premises. But we must do this in any case to establish that we have an inference, so this step isn't peculiar to the syllogism. Next we must restrict our argument to two premises so that one term is common to both premises while the other two are linked in the conclusion. No other formal feature is needed. In particular the common practice of structuring material so that the predicate term of the conclusion occurs in the first premise and the subject term in the second isn't necessary. So you can do away with mood and figure, which serve more for identifying and remembering syllogisms than testing them for validity. To my further surprise, there is even one logic text on the market that actually pares syllogistic reasoning down to this minimum.[23]

Finally, here is the application of a Venn diagram test to a syllogism that is not in standard form:

Some sale items are bargains;  
All bargains are good buys;  
So some sale items are good buys.



The syllogism proves valid by this test.

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These comments on the syllogism are offered not as complete results but as suggestions for study and experimentation. If we can free syllogistic reasoning of historical baggage, over-formalizations, and layer upon layer of technique for the sake of technique, we might end up with an efficient way of handling reasoning about class-membership relations. This in turn might merit consideration for good informal logic courses, and it might be of much value to our present and future students.

### Notes

- \* This paper was presented at the Second International Symposium on Informal Logic held at the University of Windsor in June 1983. Earlier versions of some of these ideas were presented in a paper "Piaget and Teaching Logic" at the Third Annual Conference on Reasoning, Piaget, and Higher Education in Denver, October 1982. I am grateful for helpful comments, especially to Don Urquhart. At the Windsor Conference I am indebted to Tom Gery, Tony Williams and several others for helpful comments and criticisms.

[1] *Teaching Philosophy*, Vol. 4 (1981), p. 125.

[2] *A History of Western Philosophy* (New York, 1945), p. 202.

[3] E.g. Gerald J. Massey, *Under-*

- standing *Symbolic Logic* (New York, 1970), p. 344; Dennis J. Packard & James E. Faulconer, *Introduction to Logic* (New York, 1980), p. 283.
- [4] See Bertrand Russell's "Introduction" to Wittgenstein's *Tractatus Logico-Philosophicus* (London, 1960), p. 13f.
- [5] Marlene Kramer, *Reality Shock; Why Nurses Leave Nursing* (St. Louis, 1974), p. 2.
- [6] See e.g. Robert Baker, "'Pricks' and 'Chicks': A Plea for Persons," in *Philosophy and Women*, ed. by Sharon Bishop and Marjorie Weinzweig (Belmont, 1979), pp. 21-26.
- [7] Gilbert Ryle, *The Concept of Mind* (Harmondsworth, 1963), p. 17f.
- [8] His *Logic and Contemporary Rhetoric* (Belmont, 1984) is now in its fourth edition.
- [9] Thomas, *Practical Reasoning in Natural Language*, 3rd ed. (Englewood Cliffs, 1986); Johnson and Blair, *Logical Self-Defense*, 2nd ed. (Toronto, 1983); Scriven, *Reasoning* (New York, 1976).
- [10] The phrase is Ralph Johnson's, *Teaching Philosophy*, Vol. 4 (1981), p. 124.
- [11] The abridgement of the argument of the *Theodicy* reduced to syllogistic form.
- [12] "Formal and Informal Logic," in *Dilemmas* (Cambridge, 1966), pp. 111-129; the comments on "and" as a sentence connector are quite valuable.
- [13] *Mechanical Man: The Physical Basis of Intelligent Life* (New York, 1968).
- [14] Hubert L. Dreyfus, *What Computers Can't Do* (New York, 1979).
- [15] 262 b-c; the quotations are from J.B. Skemp's translation (London, 1961).
- [16] *The Statesman*, 266e; Diogenes Laërtius, *Lives of Eminent Philosophers*, translated by R.D. Hicks (Cambridge, Mass., 1958), Book VI, 40.
- [17] Quoted in Houston Smith, *The Religions of Man* (New York, 1965), p. 205.
- [18] If you allow the order P ... S in the conclusion to accommodate ordinary-language arguments you get 512.
- [19] Some writers insist, for instance, that only nouns in plural number can be used as terms for a syllogism.
- [20] Matthew Lipman introduces the conversion of E in chapter one of *Harry Stottlemeier's Discovery* (Upper Montclair, N.J., 1974), a philosophy course for pupils in elementary school that has enjoyed success by several measures.
- [21] William Kneale & Martha Kneale, *The Development of Logic* (Oxford, 1962), p. 706f.
- [22] Richard B. Angell, "The Boolean Interpretation is Wrong," in *Readings on Logic*, ed. by Irving M. Copi & James A. Gould, 2nd ed. (New York, 1972), pp. 180-183. Strawson, in his *Introduction to Logical Theory* (London, 1963), pp. 164-180, solves this problem by refusing to assign truth values to A or E statements unless the subject class has members.
- [23] David J. Crossley & Peter A. Wilson, *How To Argue: An Introduction to Logical Thinking* (New York, 1979). But beware their interpretation of "only" as an ordinary language quantifier. Though correct on p. 92, it is mistaken in the solution to Problem 1 of Exercise III, p. 242, and undecided in the solution to Problem 4 of Exercise II, p. 238.