

Preface

These two volumes gather together the tributes of a distinguished group of colleagues and friends in honor of Professor Jean-Yves Beziau on his fiftieth birthday.

The articles in each of the two volumes (of which this is the first) fall, broadly speaking, into four categories:

1. those concerned with universal logic,
2. those concerned with hexagonal and other geometrical diagrams of opposition,
3. those concerned with paraconsistency, and
4. current work not directly connected to the work of Jean-Yves Beziau.

With these contributed papers, we want to record our gratitude for the intellectual and organizational work of Jean-Yves in uncovering a golden tradition of logical thought, and his constant encouragement to all of us to insure that tradition will continue and flourish. Many thanks, Jean-Yves. Our heartfelt thanks on this your fiftieth birthday.

With the possible exception of the last category, there are three subdivisions of universal logic as conceived by Jean-Yves Beziau. In order to understand this project, we can do no better than to recall the way in which universal logic was compactly described by Beziau in the preface to what is probably the defining collection on the subject,¹ and to expand upon it, briefly:

- (i) [**Beyond particular Logical Systems**] “Universal logic is a general study of logical structures. The idea is to go beyond particular logical systems to clarify fundamental concepts of logic and to construct general proofs.” (p. v)
- (ii) [**Comparison of Logics**] “Comparison of logics is a central feature of universal logic.” (p. v)
- (iii) [**Abstraction and the central notion of Consequence**] “But the abstraction rise is not necessarily progressive, there are also some radical jumps into abstraction. In logic we find such jumps in the work of Paul Hertz on *Satzsysteme* (Part 1), and of Alfred Tarski on the notion of a *consequence operator* (Part 3). What is primary in these theories are not the notions of logical operators or logical constants (connectives and quantifiers), but a more fundamental notion: a relation of consequence defined on undetermined abstract objects that can be propositions of any science, but also data, acts, events.” (p. vi)

¹Beziau [2].

We also mentioned that paraconsistent logics are included in the program. That should be obvious if one considers the various consequence relations to be found in that branch of logic. Also we need to mention the beautiful studies of Dov Gabbay in which he proposed the study of *restrictive access logics* as an alternative to paraconsistent logics that is an extension of classical logic.³

These restrictive access logics can be described by using a substructural consequence relation, where there is a modification of the Gentzen structural conditions on implication. It then becomes an interesting problem to see what features the logical operators have will have as a consequence.⁴ The examples of paraconsistent and restrictive logics lie well within the province of present day logic.

In contrast, what is interesting and novel is that Beziau's observation's in (iv) [**Beyond Syntax and Semantics**] permits the extension of the program beyond the more traditional range of contemporary logical systems. As he stated it, not only can we have the notion of consequence for scientific propositions, and non-propositional, non-sentential objects including, data, acts, and events, but we do now add pictures (perhaps mathematical diagrams), and even the epistemic notion of states of belief for which consequence relations exist, and the possibility of logical operators acting on pictures as well as states of belief. We are concerned with consequence relations that are beyond the semantical or proof-theoretical.

The case for a consequence relation between pictures has recently been forcefully made by Jan Westerhoff. Here, compactly, is the claim:

"I will describe an implication relation between pictures. It is then possible to give precise definitions of conjunctions, disjunctions, negations, etc. of pictures. It will turn out that these logical operations are closely related to, or even identical with basic cognitive relations we naturally employ when thinking about pictures."⁵

This example with its particular consequence relation, and the pictures it relates, is an extension well beyond the usual restriction of logic to syntax and semantics. It illustrates the broad implications of Beziau's observations in (iv) and the fertility of the project of universal logic. It is not business as usual.

Finally we will briefly describe another case due to Peter Gärdenfors,⁶ who developed a logic of propositions upon the basis of a theory about belief revision. His results can be recast in such a way that they also follow as a case where he defines propositions as special kinds of functions, and also defines a special relation among those functions that turns out to be a consequence relation. The result is fascinating: the conjunction of functions turns out to be the functional composition of functions, and Gärdenfors' special relation among the functions is a consequence relation provided that functional composition is commutative and idempotent.

More exactly, (1) let S be a set of states of belief of some person. (2) Let P be a set of functions from S to S (called propositions) which is closed under functional composition. (3) For any members f_1, f_2, \dots, f_n and g in P , let (G) be the condition

³D.M. Gabbay and A. Hunter [4].

⁴Private communication from D. Gabbay, 2005.

⁵Westerhoff, J. [6]. The implication relation proposed for pictures is similar to one that Corcoran [3] proposed for propositions, as noted by Westerhoff.

⁶Gärdenfors [5].

that

$$f_1, f_2, \dots, f_n \Rightarrow g \quad \text{if and only if} \quad g f_1 f_2 \dots f_n = f_1 f_2 \dots f_n$$

(the concatenation of two functions here indicates their functional composition).

In particular, for any two propositions (functions) f and g , f implies g ($f \Rightarrow g$) if and only if $gf = f$. It is easy to prove that the relation (G) is a consequence condition if and only if functional composition is commutative and idempotent. The logic of these propositions has been shown by Gärdenfors to be Intuitionistic, and his consequence relation (G) is clearly epistemic. Again, it is not logic as usual, but it is just one more case of the fruitfulness of the ideas that the project of universal logic embodies.

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