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Why were you initially drawn to epistemology (and what keeps you interested)?

There was no dedicated course on epistemology, when I became a philosophy student in Amsterdam. But our diet was diverse, since the active students of my generation supplemented their education by reading from the sea of wonderful publications that were available cheaply in broad public series like the Dutch ‘Prisma Reeks’, the German ‘Hochschultaschenbücher’, or English language pocket-books. Many of my long-standing interests were picked up in that way – why just follow the menu choices of your teachers in their courses? – and epistemology is no exception. For a few guilders, I bought Roderick Chisholm’s “Theory of Knowledge”, translated into Dutch by a senior fellow student, Herman Slangen, who had been to the promised land of the United States (very rare in those days) on a Harkness Fellowship. I read the first few pages about Plato’s discussion of knowledge as distinct from true belief in the “Theaitetus”, and from then on could not stop. As it happened, I had read parts of that dialogue in our classical Gymnasium, but my only memories were of Greek grammar training, where syntax took precedence over semantics. Now I saw how philosophers in Antiquity were live teachers and discussion partners today. Reading on, even though I had come to study logic, what intrigued me at once was the curious relationship between logic and epistemology. Clearly, Chisholm discussed deep and significant questions about the nature of knowledge and evidence – which my cherished logic books might have dealt with, but did not – and moreover, though his presentation contained no formulas and theorems, it was obviously rigorous, convincing

and insightful. Later on I would find the same virtues in analytical philosophers like Gilbert Ryle, and many others. Even so, I remained a logician at heart, and thus resonated eventually with philosophers like Peter Geach, Jaakko Hintikka, or Paul Lorenzen, who each in their own way managed to combine logical techniques with philosophical issues.

Ever since those student days, two things have been on my mind. One is an interest in topics like knowledge, information, belief, or learning, which live at the interface of epistemology and logic. They seem crucial to serious intellectual endeavour, and yet it is amazing to see how little substantial consensus we have about them. The other thing is the issue of research style, and just when formal methods really add to our understanding of an issue: rather than symbolic mystery, and maybe hidden agenda change. There is a quote I remember from Aristotle that “It is the hallmark of an educated mind to treat a subject with no more than the rigour which is its due”, and logic sometimes formalizes insight away. As it happens, the only Aristotle quote I can really find on the Internet is different: “It is the mark of an educated mind to be able to entertain a thought without accepting it.” That seems very true, too. My sons sometimes complain that, after some 40 years of academic life and tending its delicate balance of community interests, I no longer know what I truly accept, and would not even recognize my own beliefs if I met them.

What keeps me interested in epistemology? Well, its fundamental questions remain as important and relevant as ever, and also, the interface with logic remains lively and surprising because of a ‘friendly competition’. Logicians have new ideas and techniques to offer to philosophy (more on this below), when coming home from their travels to foreign countries like computer science or game theory. But philosophers continually manage to come up with surprising new ideas of their own. I find the post-Gettier sequence of new definitions of knowledge by Dretske, Nozick, and others fascinating in their fresh perspectives, and much more imaginative than what traditional epistemic logic has come up with. Reading the philosophical literature can be a treat.

What do you see as being your main contributions to epistemology?

All of my work in epistemology has arisen from reflection on how major epistemological themes play in logic. Writing with very

broad strokes, I would say that I use the logical mind-set to look at epistemological issues in a new light, providing new answers, but maybe more often: new problems changing the agenda. And what enabled me to do that is the position of logic at the interface of many disciplines, allowing logicians to draw inspiration from many sides.

Some of this work is just asking questions by comparing fields and research programs, since so many natural contacts and confrontations fail to happen in the academic market place of ideas. In a 1992 lecture at TARK, the conference on “Reasoning about Rationality and Knowledge”, started by a group of computer scientists, which placed epistemology at its proper interdisciplinary interface with computer science, economics, and linguistics, I gave the following example. ‘Explicit’ systems like epistemic logic analyze the meaning of knowledge on top of classical logic by introducing new modal operators, while intuitionistic logic, the oldest epistemologically flavoured formal system, is an ‘implicit’ approach, which ‘loads’ the interpretations of the standard logical constants themselves in epistemic terms. How are these two approaches to knowledge related? To me, this is still an unresolved issue, despite formal analogies at the level of the modal logic $S4$, and it may force us to rethink the very notion of information in logic.

My systematic work over the last decades has revolved around three main themes. The first strand is the importance of *information* as a crucial concept underlying knowledge, belief, and other cognitive attitudes. My publications from the 1980s and 1990s on modal and categorial logics of language and information structure (culminating in the book “*Language in Action*” from 1991) are a sustained attempt at understanding information at some abstract level that underlies all of its significant uses. I cannot say that this has been entirely successful, and there is no consensus on the basic laws of information even in logic. Therefore, my recent chapter with Maricarmen Martinez in the *Handbook of the Philosophy of Information* steps back, and brings to light three major intuitions that play across the field: *semantic-observational* in terms of ranges of options (as in Carnap’s semantic information, or the possible worlds semantics of epistemic logic), *semantic-correlational* (as in Shannon’s channel theory of information, or in situation theory), and *syntactic-inferential*, working on more fine-grained syntactic representations. The first two perspectives form a natural unity, and can be merged. The third perspective is more recalcitrant, high-lighted by the process of deduction and the notorious

problem of ‘logical omniscience’. But it really covers a wide range of processes of ‘elucidation’ that turn implicit information into explicit information: from steps of proof and computation to acts of memory and introspection. My current work is about ways of combining all three intuitions, and the processes that drive them. For instance, logical omniscience gets solved if we combine events of observation or communication with acts of ‘realization’ turning implicit into explicit knowledge. I see this unifying program as continuing classical issues in epistemology on the nature and sources of knowledge in logical terms. But, at the risk of offending some colleagues who claim to have ‘solved it all’, I see it as a goal still on the horizon, even within the restricted compass of logic.

The second strand is my work on *logical dynamics* since the 1990s, which is based on the distinction ‘product’ versus ‘process’, pointing out how logical theories should not just describe products of cognitive activities, such as proofs or sentences, but also these activities themselves. After all, a ‘statement’ is primarily something that we do, and ‘argument’ is something we engage in. I occasionally hear the same sentiments verbatim from philosophical colleagues, but then with ‘epistemology’ substituted for ‘logic’. My book “*Exploring Logical Dynamics*” from 1996 develops a theory of this based on dynamic logics of processes developed in computer science. My work since then has focused on two research lines: *dynamic epistemic logics* of information update, knowledge change, and recently also belief revision, and *logics of games* which combine logical systems with ideas coming from game theory. Together, these systems show that informational activities can be treated on a par with their products, and that a dynamic stance throws new light on many traditional problems in epistemology. A concrete example is my analysis of the ‘Fitch Paradox’ of Verificationism in dynamic terms, where the issue shifts from somewhat defensive worries about, and patches for, the consistency of verificationist positions to an activist new theme: understanding the logic of *learning processes* which themselves involve epistemic statements in addition to purely factual ones. Another example is my recent work on dynamic logics for belief change, which brings this learning process squarely in line with standard logical systems, without any need for ad-hoc formalisms. Traditional mysteries like the (im-)possibilities surrounding the ‘Ramsey Test’ for conditionals as a guide to belief revision then dissolve in the light of logic. Finally, returning to my initial example, I would now think that the real issue in understanding intuitionism is a good

grasp of the processes of discovery and definition which underlie that system in the first place—and in a recent paper, I show how this may involve a new notion of ‘procedural information’ in addition to the existing ones.

In combining information with dynamics, I have made a major turn to a third driving theme: away from single agents to *multi-agent interaction*. As a student, I thought that there was nothing grander and nobler than ignoring ‘the others’ (leaving them in Jean-Paul Sartre’s Hell where they belong), and just think about the mind of one single agent, alone with the Universe. In line with ‘interactive’ and ‘social’ trends in epistemology, and simultaneous developments in other disciplines like computer science and linguistics, however, I have now come to think that understanding information flow between different sources and different agents is not a nuisance, but actually more essential than understanding ‘one-dimensional projections’ to single agents. Thus, with due respect for Plato, I now think the surplus of knowledge over belief is not to be found in further magical ‘attunement’ to reality, but in the powers that agents have for maintaining true belief as new information comes in, and criticisms by others have to be faced. I am currently engaged in a project with Alexandru Baltag and Sonja Smets of looking at the development of epistemology after Gettier, systematizing the innovative approaches proposed since by Dretske, Nozick, and others in terms of multi-agent information dynamics. We find that many things fall into place, while ‘dynamic epistemic logic’ suddenly acquires an importance that epistemic logic per se never had. Another instance of this multi-agent stance is recent work on acquiring and maintaining common knowledge, which turns out to have many surprising process structures beyond traditional epistemic logic. But I find my thinking turning in still more radical directions. Only last year, I wrote a paper on belief change and belief merge which gives an underpinning for existing revision policies in terms of *social choice* between inputs from different sources. Maybe we ourselves are in fact communities, and the idea of a rational agent as a ‘society for observation and deliberation’ exerts a strong attraction on me right now.

Eventually, I see this multi-agent perspective as a return to my initial Chisholm inspiration. Plato’s “Dialogues” themselves are a social activity, and as such, as good a paradigm for logical theory and practice as agent-free mathematical proofs. And I would even say that the best standard of Plato’s ‘justification’, or the modern notion of ‘evidence’, is how well it functions in contacts

with *others*. How did philosophy, from these interactive beginnings, develop into what Popper once described as a cult of great philosophers preaching Sermons from the Mount? Why is philosophy one of the last subjects where joint papers are considered acceptable? I hope the wheel will turn.

What do you think is the proper role of epistemology in relation to other areas of philosophy and other academic disciplines?

As I have often said (is repetition laudable consistency, or just old age?), I find traditional divisions into fields like logic, philosophy of science, epistemology, or philosophy of information a perhaps necessary, but also misleading nuisance. What counts is rather the natural development of *themes*, such as knowledge, information, and the processes which produce and transform these. One should just follow themes wherever they lead, without worrying about a visa for the next sub-field. For instance, much recent work with my students is about the notion of *preference*, its interaction with information flow, its dynamic changes under triggers like commands or suggestions, and its social structures with changing group preferences. That theme was not planned: it just happened naturally in the course of thinking about rational agency. Are we now suddenly leaving epistemology, trespassing on the philosophy of action or social philosophy? My mental map of my intellectual environment runs along with natural development of themes, and I wish more histories of ideas were written that deviate from the accepted ‘subfields’. Given all that, I think epistemology is about major issues that are of importance across many disciplines, and it would be a pity if epistemologists chose to just talk to themselves, and at best some fictional further discussion partners like the Sceptic, Swampman, and the like. There are so much more interesting live communities to interact with!

What do you consider to be the most neglected topics and/or contributions in contemporary epistemology?

I have hated this question in every book in this wonderful Series, since any answer is bound to sound, and bound to *be*, arrogant. But if I were to mention something that strikes me, it would be the lack of contacts with other disciplines: logic for sure, but also

other sciences of information, such as computer science (informatics), information theory, and so on. And also, I would think that the development of empirical fields like cognitive psychology and cognitive science might be more of a challenge. I am always amazed at the insulation techniques that philosophers use to keep their discourse free from externally refutable claims. The classical ‘barrier thesis’ of ‘anti-psychologism’ is a famous example, but the attitude is of all times. At a recent lecture, I heard a hour of wonderful presentation on information, knowledge, cognitive architecture, and rational agency – and (I should have brought a tape recorder) the frequency of expressions like “this is the common sense account of how we do it” was high. When I asked the speaker what precise claim (s)he was making, the answer was that philosophers had analyses of a subtlety unmatched in the crude minds of psychologists, scientists and so on. Maybe so, maybe probably so. But if so, why not go out, and show it?

One reason why I feel justified in preaching are the outreach efforts that I myself am engaged in, with Amsterdam’s ‘Institute for Logic, Language and Computation’ and Stanford’s ‘Center for the Study of Language and Information’ as long-standing bases. An epistemologically relevant example is the recent *Handbook of the Philosophy of Information*, edited with my colleague Pieter Adriaans, which brings together philosophers with mathematicians, physicists, linguists, psychologists, game theorists, and computer scientists. In preparing this handbook, I learnt a lot from my fellow editor. Trained as a continental philosopher going for the Large Questions about Knowability of the Universe, but wholly open to, and deeply conversant with ideas from mathematics, the natural and computational sciences, he disturbed my dogmatic slumbers about the analytical tradition in philosophy being the more science-friendly milieu.

What do you think the future of epistemology will (or should) hold?

It is a commonplace to say that epistemology has become more informal over the last decades, drifting apart from logic – even though (or precisely because?) many major epistemologists started out as logicians. I foresee new contacts between epistemology and logic, if only, because the philosophers are ahead of the logicians now in their rich new accounts of knowledge based on counterfactual tracking, evidence, and the like. Out of sheer intellectual

curiosity, logicians are bound to start looking at these ideas, taking them further, and asking to be allowed to ‘play’. More generally, the current trend toward ‘Formal Epistemology’ is natural, as it shores up informal discussions, tests proposed ideas to a greater extent than possible otherwise, inputs new ideas from elsewhere, and opens more potential interfaces with other disciplines. Even so, I do not foresee a return to classical contacts with logic as a ‘most favoured trade partner’. We might all be better off if epistemology were the area where philosophy meets with a large array of formal disciplines: logic, information theory, probability theory, learning theory, complexity theory, and so on. What is the status of this claim? As long as a university pays my salary, I am a professional optimist and wishful thinker, letting duty coincide with inclination: the preceding is both what I predict, and what I would like to happen.