(An interview with Chongli Zou, carried out largely in writing from Fall 2005 to January 2006. To be published in a Chinese journal called *Contemporary Linguistics*.)

From Logic to Language — Visiting Professor Barbara Hall Partee

Zou: In the 1980s, following the introduction of R. Montague's *Formal Philosophy* in China, Chinese scholars began to read your compilation entitled *Montague Grammar*. Since then, as the first international scholar who introduced *Montague Grammar*, on which formal semantics is based, you have established a reputation among Chinese scholars. Unfortunately, however, they still know little about the stories behind your experience. As far as I know, you obtained your Bachelor degree in mathematics, then turned to study syntactic theories in your doctoral program under the supervision of Noam Chomsky, before changing your research interest once again toward formal semantics, which was heavily based on modern logic. What led you to adjust your research orientations?

Partee: I benefited from the American tradition of "liberal arts" in undergraduate education, which allowed me to study philosophy and Russian (and other things besides) while majoring in mathematics; I really liked mathematics and languages both very much, and was excited when I discovered the existence of the field of linguistics, which under the new direction Chomsky had given it looked like a good field for my combination of interests, which it certainly was. And I was also lucky that it happened that in my first teaching position, at UCLA (University of California at Los Angeles), David Lewis introduced me to the philosopher and logician Richard Montague just at the time when he was starting to do his ground-breaking work on the formal semantics of natural languages – I think it was 1968. David Lewis and I had known each other since our undergraduate days at Swarthmore, so David knew I would be interested in Montague's work. I certainly did find it interesting, and soon started working on ways to combine Chomskyan syntactic theory with Montague's semantics. Montague died tragically young in 1971, which was a terrible shock, but I continued working on what I called "Montague grammar", which gradually developed more broadly into formal semantics. References: (Partee 2001, Partee 2004, Partee 2005).

Zou: In the course of Western academic development, both logic and linguistics have had a long tradition respectively. What has caused these two disciplines to merge into one trend since the 1950s? The grammatical frameworks proposed by Chomsky benefit many a deductive approach from logic, and are thought of as a "Copernican Revolution" among the linguistic community. Richard Montague, however, went even further by adopting logical semantics to analyze the semantic issues in natural language and managed to establish the corresponding relationship between the syntactic categories in natural language and the semantic types in logic. As for such a

stricter relationship, can we have any reason to claim that Montague Grammar is the extension of Chomskyan Grammars?

Partee: Yes, I certainly think so. As Emmon Bach put it in his China lectures (Bach 1989), Chomsky showed how natural languages could be treated as formal languages, and Montague showed how they could be treated as interpreted formal languages. There can in principle be syntax without semantics, and Chomsky has always regarded syntax as an autonomous discipline. Montague famously remarked "I fail to see any great interest in syntax except as a preliminary to semantics." (From the notorious footnote 2 of (Montague 1970a), p. 223 in (Montague 1974).) In my own work I have certainly always viewed formal semantics as adding a semantic component to an existing syntactic component, perhaps with modifications to the syntax motivated by the need for a systematic syntax-semantics interface.

Zou: Montague Grammar (MG), in a certain sense, goes beyond Chomskyan Grammars, but is by no means able to substitute the latter ones. As a matter of fact, GPSG and HPSG are theories that developed after Chomskyan Grammars since the 1980s. These theories more or less follow the semantic approach adopted by MG.. Does this mean that MG, as well as those formal semantic frameworks derived from it, is not so successful as Chomskyan Grammars in terms of the syntactic component or other components? What are the advantages of Chomskyan Grammars, from which formal semantics should learn?

Partee: There are two different ways to think about what MG is. Montague's theory has both syntax and semantics and a compositional relationship between them. The broadest form of the theory, as spelled out in "Universal Grammar" (Montague 1970a), is compatible with many different particular ways of doing syntax, as long as the syntax can in principle be represented as an algebra, and the semantics as an algebra homomorphically related to it. In that sense, GPSG and HPSG "are" Montague grammars, since they can be formalized in such a way, and their associated semantics is done compositionally. And my early attempts to combine MG and Chomskyan transformational grammar (TG) were directed in part to reformulating TG so that it could also be represented algebraically and interpreted compositionally, which required certain changes in the architecture.

In another sense, one can look at the particular syntax that Montague used in his best-known work, "PTQ" (Montague 1973), which was a modified version of Categorial Grammar. Linguists are divided on the extent to which Categorial Grammar, with or without various modifications, is a good theory of natural language syntax. Some linguists considered Montague's syntax rather primitive, and were impressed by his semantics but not by his syntax; this is reflected, for instance, in the fact that the first full textbook (Dowty et al. 1981) was called *Introduction to Montague* ***Semantics***, not *Introduction to Montague Grammar*. Others found Montague's actual syntax also interesting and worth developing, as for instance Emmon Bach did in his work on generalized Categorial Grammar, (Bach 1987),

which was one of the influences on HPSG.

Certainly Chomsky has remained dominant in the field of syntax in the West, but I am not sure that his theoretical approach to syntax is as superior to others as his numerical dominance would suggest. But there is certainly much to learn from Chomskyan syntax, and I would particularly emphasize three things: (1) the emphasis on going beyond description to try to achieve explanations; (2) the emphasis on searching for what is universal in human language, and in what ways languages can differ from one another; and (3) the emphasis on first language acquisition as a phenomenon whose explanation in principle goes to the very heart of linguistic theory. Semanticists are also trying to make progress in those directions.

Zou： Formal semantics has been developing for 30 years, which proves a close tie between logic and natural language. It is said that logic is a tool of analyzing natural language. This view can be verified by the fact that the semantics of natural language means logical methods plus examples from natural language. The development of semantics has to follow that of logic; that is to say, the achievements of semantics depend mainly on those of logic. There is another view, on the other hand, in which, since natural language and logic have different structures, the former cannot entirely rely on the latter. Although the idea of Montague's universal grammar concentrates on their similarities, the diversities still remain. For example, logical systems need to get the proof of its soundness and completeness, while fragments of the natural language seem not to seek for such a goal. Therefore, formal semantics has its own trail of development, progressing independently along its own path once it borrows the fundamental techniques from modern logic. How can we better understand the relationship between formal semantics and logic?

Partee: As in many sciences, semanticists have found it valuable to adapt and add to the existing tools of formal logic in order to try to get a closer fit with what we find in natural language. Montague himself did considerable original work in designing his intensional higher-order typed logic IL in order to make it suitable for properties he found in natural language semantics; he also made interesting innovations in the logic underlying his formal pragmatics (Montague 1970b), so as to accommodate such things as tenses and first-person pronouns, whose interpretation depends on the context of use. Formal semanticists have continued to work on the logical underpinnings of their theories, and different researchers have had different ideas about what sorts of formal tools are best. Chierchia and Turner, for instance, argued that intensionality cannot be adequately captured as long as the functions from possible worlds to extensions are analyzed with the set-theoretic concept of functions; they advocate replacing set theory with property theory in the very foundations of the model-theoretic interpretation of the logic (Chierchia and Turner 1988). There has been important and relevant work on modal logic and tense logic. And linguists working on the semantics of conditionals, especially Angelika Kratzer (Kratzer 1991), have followed and strengthened David Lewis's observation (Lewis 1975) that *if*-clauses are best analyzed as restrictors on quantificational or modal operators,

rejecting the idea that they express part of a two-place *if-then* relation in the logic of natural language. The work on adverbial quantifiers and unselective quantification described in the papers in (Bach et al. 1995) is also a good example of the way linguists consider which ideas they adapt take from existing work by logicians and where they may find a need for new formalizations. I think in every science there are such interactions between mathematicians and working scientists – we need the help of the specialists, but we also need to think about what is best for our own applications, and sometimes the applications may inspire some mathematicians and logicians to new work (as in the cases of Barwise, van Benthem, Kamp, Link, Groenendijk and Stokhof, and Muskens, for instance; see such works as (Barwise 1989, Groenendijk and Stokhof 1990, Groenendijk 1987, 1989, Kamp 1971, Kamp 1979, Kamp 1984, Link 1983, Link 1998, Muskens 1989, van Benthem 1983, van Benthem 1995).)

Zou: Those philosophers, such as Charles Morris and Rudolph Carnap, treat language as a sign system and carry out their research from three strata: syntax, semantics and pragmatics. In fact, this is also the methodology adopted in the study of formal semantics. From a broader point of view, the study of semantics can be thought to cover the aspects of pragmatics. The current trend of formal semantics inevitably touches on many pragmatic factors. Are there many difficulties remaining unsolved in the process of applying logical means to the study of pragmatic issues? What are the latest advances in formal pragmatics and computational pragmatics?

Partee: Yes, I agree that the extension of formal semantics into formal pragmatics is one of the important current developments, and I touched on it in my previous answer. See the references there to work by Kaplan, Stalnaker, Lewis, and more recently Kadmon, Potts, and others. I am not the greatest expert in this area, but I am very much impressed with some of the work in this area. Besides the references I mentioned above, see also (Beaver 2001, Chierchia 1995, Dekker 1993, Dekker 1996, Engdahl 1999, Gazdar 1979, Ginzburg 1992, Groenendijk and Stokhof 1984, Guenthner 1978, Kamp 1978, Kratzer 1999, Krifka 1995, Merin 1992, Montague 1968, Partee 1999a, Potts and Kawahara 2004, Roberts 1995, von Fintel 2001, von Stechow 1990, Zaefferer 1986). I realize that is a "lazy answer", so I should try to say a little bit about what I consider the main advances and continuing difficulties. I think that the first important unification of semantics and pragmatics came in the work of Kaplan, Montague, Stalnaker, and Lewis: replacing simple Carnapian intensions, functions from possible worlds to extensions, by richer intensions, functions from possible worlds plus 'contexts' to extensions, where contexts included such factors as speaker, addressee, and time and place of utterance, eventually enriched to include the 'speech act context' as a whole, including such aspects of the speaker's intentions as intended referent of demonstratives, etc. The next big step was the move to "dynamic semantics": not only does interpretation depend on the context, but some aspects of interpretation may also affect the context, updating it in various ways: this started with the work of Kamp and Heim, and was extended with the work of Groenendijk

and Stokhof, Chierchia, Beaver, Dekker, Roberts, von Fintel, and others. The dynamic perspective has led to the rethinking of a number of earlier semantic analyses, and there are many open questions concerning the architecture of 'formal semantics plus pragmatics'.

Some aspects of traditional pragmatics, such as politeness, have for the most part remained outside of formal pragmatics, but even this is changing, as illustrated in the work of Potts and Kawahara (2004) on Japanese honorifics and the work of Kaplan (Kaplan 1999), Kratzer (1999), Potts (2003) and others on 'expressive meaning'. Domains in which there are ongoing debates about the division of labor, or even the distinction, between semantics and pragmatics include topic and focus (or "information structure" more generally), presupposition, negation, conditionals, and interrogatives. This is an exciting and active area.

You mention computational pragmatics. I should mention here that there is a great deal of active work, much of it very recent, in computational semantics, and this is naturally extending into computational pragmatics as well. I am not a specialist in these areas, but in the answer to one of your later questions I will mention some references and some links to useful websites in computational semantics. Some of these sites include work on computational pragmatics, about which I know very little.

Zou: *Handbook of Logic and Language* is a prestigious review of the latest achievements in formal semantics. You wrote the first paper in the book, entitled "Montague Grammar", proving your standing in the field. In the last 30 years, you have witnessed the whole developmental process from the birth of Montague Grammar to Generalized Quantifier Theory, Discourse Representation Theory, Situation Semantics and Categorial Type Logics. Do you think that Montague Grammar still leaves room for further study? And, what do you think of the respective prospects for those formal semantic theories that emerged after Montague Grammar?

Partee: I think that pure Montague Grammar is now largely a historical topic, in that virtually everyone works with some theoretical framework that departs from Montague's in one or more ways. (Ironically but not surprisingly, now that Montague Grammar is largely history, the term "Montague grammar" has finally qualified for inclusion in the *Oxford English Dictionary*, as of December 2002.) I believe it will remain an important reference point for some time, because it is so explicit and well-defined, and it set the stage for so much of what followed. The term "formal semantics" is the standard term now, covering Montague grammar and its descendants, including all the theories you mentioned and others besides. Formal semanticists who work with different theories form a respectful community, giving one another friendly criticism and encouragement. I don't see those alternative theories as competitors in a zero-sum game. The way I look at it, different people put their energies into exploring different hypotheses about what the theory should look like, and we all learn from one another and borrow ideas from one another. Particularly fruitful ideas tend to become common property of multiple theoretical frameworks. And overall, I think progress has been good and will continue.

It's true that I've witnessed and participated in the whole development. I think I was the inventor of the term "Montague grammar" shortly after Montague's untimely death in 1971. My perspective on the development of Montague grammar and then formal semantics is described in my semi-autobiographical essay "Reflections of a formal semanticist"; the short form is published (Partee 2004), and a longer form is on my website http://people.umass.edu/partee/docs/BHP_Essay_Feb05.pdf.

Zou: In 1986, you were President of the Linguistic Society of America, and you are one of the founders of formal semantics in America. Does this mean the practice of the application of logic and mathematical approaches in linguistic is becoming popular in American academia of linguistics, and that such a practice has aroused as great an influence as Chomskyan Grammars?

Partee: I think it's not so much the application of logic and mathematics *per se* that has become mainstream, but rather the field of formal semantics. There is recognition that one needs to study a certain amount of mathematics and logic in order to become a serious researcher in formal semantics, so many programs do require some mathematical background (for instance, a 'Partee, ter Meulen and Wall' course), and probably all programs at least encourage it if they don't require it; for students studying semantics it is also recommended to take as many logic courses as possible. (For students in some other areas of linguistics, other kinds of mathematics are recommended or required – for instance statistics courses for those doing experimental work in psycholinguistics or phonetics.)

In my semi-autobiographical essay, I noted the progress of formal semantics in the curriculum of linguistics departments over the years, starting from none in the 1960's to the point where by the 1990's it had become a core subject on equal footing with syntax and phonology in many departments. The leading departments had 0-1 semanticists in the 1960's, 2-3 by the 1990's. And although of course I may be biased, I do believe that the Montagovian revolution was as important for semantics as the Chomskyan revolution was for syntax. But I think Chomsky can be credited with revolutionizing the entire field of linguistics, and what Montague did was in many ways a natural next step (even though Chomsky himself rejected it.) One interesting difference, and part of the reason for Chomsky's negative attitude, is that Chomsky emphasized the mind-internal construction of grammar, whereas Montague, like Frege, emphasized the public, external (though abstract) nature of truth-conditions (relative to a model) as abstract properties that sentences of a language have. As David Lewis pointed out, languages may have the semantic properties they have in large part because of what is in the mind of the language users, but the properties themselves are not mind-dependent.

Zou: As everyone knows, the United States has been the center of theoretical innovation in many fields in the past few decades, including the area of linguistic and logic research. For instance, Chomsky at MIT is the founder of Transformational Grammar; Montague at UC is the initiator of Formal Semantics; and John Barwise, as

a mathematical logician, is an important founder of Generalized Quantifier Theories and Situation Semantics. However, in the past decade, the situation seems to have been changing slightly. Van Benthem, M. Moortgat and G. Morrill, who are among the most important scholars of Categorial Type Logics, all do their work in Europe. Even some American scholars have moved their research bases to Europe. It seems that Europe is replacing the States and becoming the new center of formal semantics. Is this the case? And if so, why?

Partee: Hmm, that's interesting, I would never have thought of that question – I don't usually think of what country semanticists come from or live in any more than whether they are male or female – I am just as surprised as whether you asked me about whether women are replacing men as the center of formal semantics – I just don't think in those categories when I think about semantics. But let me try to think about it now and see if I can answer.

On the one hand, -- why I find the question surprising and unusual. It's a small world now, and with respect to intellectual disciplines like linguistics, I tend to see the world more in terms of intellectual communities than in terms of geographical boundaries. Europe, the U.S., and Canada have been part of a single intellectual community for a long time, with scholars moving back and forth between them with relative ease. Israel and Japan have been a part of that same intellectual community for a very long time, and Korea for almost as long. When one thinks of 'centers', it's more likely in terms of specific universities – for instance, in terms of where the best Ph.D. programs are in a given field, or research programs where visitors would choose to come to spend their sabbatical leave, etc.

So when I give students advice about where they might want to try to go for graduate work, especially students who are themselves coming from countries outside this US-Europe centered community, I suggest that they read current journals and look at things available online to try to see where the work is going on that they think they would find most interesting, and then to learn as much as possible about the graduate programs in those places – perhaps communicating with graduate students there to learn more from a students' perspective – and then apply to several such places. For a student interested in formal semantics, the best places might well include several in the U.S. and several in Europe. For those who are equally interested in Chomskyan syntax and formal semantics, I think the best places are in the US; for those who are interested in the formal logical and mathematical side of semantics, probably the best places are Amsterdam and UCLA. For those especially interested in computational semantics, some of the best places are in Germany and the Netherlands, and also the University of Pennsylvania.

But now to your question itself, even though in a sense I disagree with its premise. (And I will probably continue to show my disagreement even while I try to answer it.) Your background is in logic, and you are probably particularly interested in logicians who work on formal semantics and contribute to it. So let's think about where the main work of that kind has been in the past and where it is now (and the nationalities of the people doing it – part of what makes this difficult is that there are many

Europeans working in the U.S. and some, though fewer, Americans working in Europe; and there are quite a few people who have moved back and forth.) Montague, David Lewis, Richmond Thomason were early leaders and Americans in America. Montague was building on the work of his teacher Alfred Tarski, a Polish Jew who escaped to America just before World War II and taught at the University of California at Berkeley (see the wonderful recent biography of Tarski by Feferman and Feferman, which also contains biographical information about Richard Montague), and also on the work of Rudolf Carnap, who was born and studied in Germany, moved to Vienna and then Prague and then to the US in 1935, taught at the University of Chicago 1936-1952, and at UCLA from 1954 until his death in 1970; and of course the influence of Frege (German) on both was profound. One of Montague's Ph.D. students who has done a great deal of important work in formal semantics is Hans Kamp: he is a good example of the hopelessness of drawing sharp national boundaries. Hans was born in the Netherlands of a Dutch mother and a German father, got his Ph.D. in the U.S., then held a position in England for many years, then briefly at the University of Massachusetts, then at the University of Texas for a number of years, then moved to the University of Stuttgart in Germany, where he has been since 1988. In our own department, our semanticists have been me (American), Emmon Bach (naturalized American, born in Japan of Danish parents, Ph.D. from University of Chicago), Angelika Kratzer (German), and Christopher Potts (American.) Before Christopher Potts, our 'junior' semantics position was held by Lisa Matthewson, a New Zealander who got her Ph.D. in Canada, at the University of British Columbia, which later hired her away from us. The two main semanticists at MIT, Irene Heim and Kai von Fintel, are both German and both got their Ph.D.s at the University of Massachusetts. I could go on and on – the American universities are very international, and both our graduate students and our faculty are a mixture, mostly American, Canadian, and European, but with Japan, Korea, and Israel also well represented, and other countries to a lesser degree.

The way to check the answer to your question, which I won't try to do here, is to look through the tables of contents of the journals in the field, and identify the nationalities and the university appointments of the authors of the articles. For semantics I would look at four journals: (i) For semantics considered broadly, not only formal semantics, *The Journal of Semantics*. (ii) For formal semantics since its early years, *Linguistics and Philosophy* (its first issue was published in 1977). And two younger journals, which represent two different emphases and the beginning of a possible American – European split: (iii) *Natural Language Semantics*, edited since its beginning in 1992 by Irene Heim and Angelika Kratzer, whose emphasis is on semantics as a part of linguistic theory, especially the syntax-semantics interface, and (iv) *The Journal of Logic, Language, and Information*, founded at about the same time, edited in the Netherlands and treating semantics within the context of logic and computation. I think one will find a mixture of Americans, Europeans, and others in the table of contents and on the editorial boards of all four journals over the years of their existence, perhaps with a preponderance of Europeans in the last-mentioned journal.

For my own perspective on the slight divergence in recent years between American and European work in semantics, I can offer an extract from my semi-autobiographical essay:

> By the 1990's, there was noticeably less direct interaction between linguists and philosophers in semantics, in part because within philosophy interest in the philosophy of language had declined as interest in philosophy of mind increased. There was also some divergence between directions in formal semantics in the Netherlands and directions in the U.S., which previously had been very close. The founding in the late 1980's of the predecessor of the interdisciplinary ILLC (Institute for Language, Logic, and Computation) at the University of Amsterdam led to the founding in 1990 of the European Foundation for Logic, Language, and Information (FOLLI) which sponsors a new journal of the same name (*JOLLI*) and annual summer schools (ESSLLI) that always include courses on the latest developments in formal semantics. Within that framework, linguistics is just one contributor to the semantics enterprise, and perhaps subordinate to logic and computation.
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> In the U.S., on the other hand, there has been a move toward putting semantics more firmly inside linguistics. After fifteen years in which *Linguistics and Philosophy*, founded in 1977, was the preeminent journal for formal semantics, a new journal conceived and edited by Irene Heim and Angelika Kratzer was launched in 1992, specifically aiming to integrate formal semantics more closely into linguistic theory, as suggested by its name, *Natural Language Semantics*. Heim and Kratzer are also the authors of what one might call a fully post-Montague textbook in formal semantics, (Heim and Kratzer 1998). And the American conference series SALT (Semantics and Linguistic Theory) had its first annual meeting at Cornell in 1991. What is new in both the journal and SALT is that it is permitted to presuppose that the audience knows some contemporary theory of syntax. Whereas articles in *Linguistics and Philosophy* are in principle supposed to be readable by both linguists and philosophers, that is not a requirement for *Natural Language Semantics*, nor for SALT talks. So one can see an increasing specialization into more logical, computational, and linguistic aspects of formal semantics, albeit with continuing overlap and interaction.

But I would say that the overlap is greater than the divergence, and the clearest evidence of that is the ease with which semanticists move back and forth between American and European universities, both for Ph.D. and postdoctoral studies and in faculty positions. Just a few current examples: (i) Manfred Krifka, Ph.D. from University of Munich, taught for many years at the University of Texas, and is now head of the linguistics department and of the linguistics research institute ZAS in Berlin; we tried unsuccessfully to hire him at UMass when I retired. He has been Editor-in-Chief of *Linguistics and Philosophy* and is now Editor-in-Chief of *Theoretical Linguistics.* (ii) Marcus Kracht was for many years in Berlin and is now on the faculty at UCLA, which is one of the strongest American universities in mathematical linguistics and the formal side of linguistic theory (the faculty in and around linguistics there also include Ed Keenan, Daniel Büring (German), Ed Stabler, Philippe Schlenker (French), Terence Parsons). (iii) Gennaro Chierchia is Italian, and

after studying philosophy and logic in Italy, he got his Ph.D. in linguistics at UMass Amherst in 1984, then taught at Brown University for a short time and at Cornell University for seven years, before accepting a chair in 1992 at the University of Milan. He was recently offered a position at Harvard University (which as far as I know is still being negotiated.)

So apart from the slight difference in emphases that I mentioned already, I do not see any substantial change in momentum in semantic research from America to Europe or vice versa, but rather the flourishing of many different directions in semantics in both places, as well as in Israel, Canada, Japan, Korea and elsewhere, and close collegiality across these permeable borders.

Zou: We all agree that formal semantics is a multi-disciplinary study, since it is not only related to maths and logic, but to many issues of language philosophy. In addition, computational linguistics always shows great interest in its achievements; and advances in certain aspects of the cognitive sciences are also indispensable to the achievements of the semantic study carried out by formal semantics. Thus, my questions are the following: how can we understand the fact that formal semantics can facilitate the development of modern logic? What kinds of help can it offer in solving the problems of language philosophy? To what extent do/will these achievements benefit the field of natural language understanding (machine translation)? What are the practical steps of applying formal semantic approaches in the study of the cognitive sciences?

Partee: These are big questions, and they go rather far beyond my direct competence. I can only give very small and inadequate fragments of answers, and these should not be taken too seriously. (i) If formal semantics benefits the development of modern logic, it is probably indirectly by posing problems for logicians to try to solve. I mentioned above the "dynamic" direction that formal semantics is taking in recognizing two-way interactions between language and context. Semanticists show the need for a certain kind of logic, and then logicians may take up the challenge and work on developing such logics. Similarly for the challenge of hyperintensionality and the kinds of logics developed to try to solve that problem, plus property theory as an alternative to set theory. Other areas where logicians have helped to work on problems that arise in semantics are tense logics, modal logics, logics of conditionals, alternative treatments of presupposition, logics of interrogatives, of imperatives, and of other kinds of speech acts.

(ii) Natural language semantics and the philosophy of language have been interconnected from the beginning. In my answer to the previous question I mentioned some divergence between philosophy and semantics in recent years, but there are still substantial connections. Much philosophical argument, not only in the philosophy of language, is based in part on natural language, and often on the semantics of ordinary language expression. To that extent it is always useful to be able to make use of the best semantic analysis available, and this is one area where linguists can often offer improvements over what philosophers unaided are able to do. See, for example, Angelika Kratzer's and Kai von Fintel's contributions to work on

conditionals (Kratzer 1981, Kratzer 1986, Kratzer 1991, von Fintel 1992, von Fintel 1998), Gennaro Chierchia's and M.J. Cresswell and Arnim von Stechow's contributions to the analysis of *de se* and *de re* belief (Chierchia 1989, Cresswell and von Stechow 1982). The paper by Cresswell and von Stechow is one of a number of examples of collaborations between linguists and philosophers on problems of common interest; other such examples include (Barwise and Cooper 1981, Bennett and Partee 1972, Condoravdi and Gawron 1996, Cooper and Parsons 1976, Kadmon and Landman 1993, Kamp and Partee 1995, Keenan and Moss 1985, Keenan and Stavi 1986, Keenan and Westerståhl 1997, Szabolcsi and Zwarts 1992-1993).

(iii) As for contributions of formal semantics to computational applications (and some contributions in the opposite directions, since in semantics as in any field, the demand to find solutions for applied problems can stimulate work that also benefits 'pure science'), these have been quite direct, at least for those approaches which strive to build on theoretical foundations. Before the advent of formal semantics, linguistics had very little to offer to the semantic side of computational applications other than in the lexicon. An early and exciting example of computational work that builds on formal semantics is the unfortunately short-lived but very elegant "Rosetta" machine translation project that was sponsored by the Philips Corporation and directed by the computational linguists/formal semanticists Remko Scha and Jan Landsbergen (Appelo 1986, Landsbergen 1987, Rosetta 1994). That project was both computationally and semantically interesting; but unfortunately the Philips Corporation abandoned the field of natural language applications before the project had reached its full potential and the group that worked on it was disbanded. Other applied projects that have the participation of formal semantics are described in (Blackburn and Bos 2005, Frost 1987, Gazdar and Mellish 1989, Moortgat 2001). See also Kyle Rawlins' website "Computational Semantics Information" http://people.ucsc.edu/~krawlins/clsbib/, and the website of the Association for Computational Linguistics Special Interest Group on Computational Semantics (SIGSEM) http://mcs.open.ac.uk/pp2464/sigsem/.

(iv) The relevance of formal semantics to cognitive science arises in several different ways. One is foundational: just as linguistics as a whole is a primary domain for raising basic questions about the nature, representation and acquisition of human knowledge, semantics is a crucial domain for investigating the relation between language and human belief, perception, and action. Morris and Carnap, whom you mentioned earlier, viewed semantics as treating the relation between language and external reality (or models of reality), whereas linguists in the Chomskyan tradition have viewed semantics as concerned with the relation between language and some sort of mind-internal semantic representation. I see the challenge as one of explicating the interactive relations among language, reality, and the mind. Leaving out reality, as Fodor, Chomsky, and Jackendoff seem to want to do, leads to 'narrow psychologism', and neglects the fact that we make assertions that have truth-commitments, even if we cannot always know whether they are actually true. Leaving out the mind, as Frege and Montague do, is probably feasible at most for some limited subsets of natural language. Formal semanticists who are linguists generally hope eventually to be able

to provide a satisfying picture of semantics that shows how the semantics "of the language" (in Montague's sense) is determined by the interaction of the semantic competence of language users (in a suitably Chomskyan sense) with the environment in which they use their language. For some of my work in this area (not completely successful, however), see (Partee 1979a, 1977, 1988, 1979b, 1982); see also (Cresswell 1978, Jackendoff 1996, Stalnaker 1984, 1999).

Zou: You have been pursuing the study of formal semantics for many years. What are your main research interests at the moment? As a member of editorial boards for several formal semantic journals, such as *Linguistics and Philosophy* and *Natural Language Semantics*, what are the crucial issues you think American scholars are currently interested in? In recent years, you have spent one academic term every year lecturing in Russia on formal semantics. Do you think that formal semantics will develop successfully in Russia, since it is a nation with a strong tradition in mathematical studies? Can you foresee the prospects for formal semantic studies in the international academic community?

Partee: My research and teaching interests center on formal semantics and its connections with syntax, pragmatics, and logic, and on related issues in the philosophy of language and in cognitive science. One lifelong interest is quantification. An NSF-supported project with Emmon Bach and Angelika Kratzer dealt with cross-linguistic quantification and semantic typology (Bach et al. 1995). Another project in collaboration with Eva Hajicova and Petr Sgall of Charles University, Prague, concerned topic-focus structure and quantification, integrating the contemporary Prague school approach with work in formal semantics (Hajičová et al. 1998).

Other areas of recent and current research include the semantics of adjectives and prototype theory (with Hans Kamp) (Kamp and Partee 1995, Partee in press-a), the interaction of noun phrase semantics with verbal aspect (Partee 1999b), and the semantics of specificational pseudocleft sentences and the question of inversion around "be" in English (Partee 1999c).

The main focus of my recent and current research, joint with my husband Vladimir Borschev, is the integration of lexical semantics (especially including Moscow School lexical semantics) with formal semantics, including issues of type-shifting and of sortal structures and sort-shifting. A recent NSF grant (1999-2003; http://people.umass.edu/partee/Research.htm#Grant) with Borschev and other Russian colleagues and with UMass graduate students concerned the semantics of genitive (possessive) constructions with relational and non-relational nouns in English and Russian, focusing on problems of the interaction of lexical semantics, compositional semantics, and context (Borschev and Partee 2001, Partee and Borschev 2001, Partee and Borschev 2003). I don't really know anything about Chinese, but some work by the student Henrietta Yang got me interested in some properties of Mandarin possessives, and I wrote a short paper about that recently (Partee In press-b).

Our current NSF grant (2004-07; http://people.umass.edu/partee/Gen_Neg/) focuses on the semantics and distribution of the Russian genitive of negation and its relation to a range of issues including "perspectival structure", existential sentences, scope of negation, unaccusativity, and diathesis shift, semantic bleaching and other effects of the interaction of lexical and compositional semantics (Borschev and Partee 2002, Partee and Borschev 2004). The work on Russian Genitive of Negation has also led to interesting work on sentential vs. constituent negation with several Russian colleagues (Borschev et al. 2006).

And a long-term interest relating to philosophy and cognitive science is the bridging of the apparent divide between 'logical' and 'cognitive' approaches to the foundations of semantics; I mentioned several of my papers in that area earlier.

The field of formal semantics has grown so large now that I cannot even begin to try to list all the topics that semantics researchers are interested in. Topics range from problems of lexical semantics (in which there was a great deal of work in many frameworks long before formal semanticists began to take it seriously) and specific descriptive problems like the semantics of *only* or the semantics of proper names or of tense and aspect or plurality, to emerging areas like semantic typology, the psycholinguistic investigation of semantic processing (resolution of scope ambiguity and of anaphora, the interpretation of interrogatives, the relative difficulty of processing and interpreting different kinds of relative clauses), and the integration of semantics and pragmatics that we discussed earlier. I think that a good way to get an idea of the interests of formal semanticists at any point in time is to use the internet to browse the tables of contents of the journals that I mentioned earlier, the program for conferences such as SALT (the program for SALT 16 in 2006, in Japan for the first time, can be found at http://research.nii.ac.jp/salt16/program.html), and the topics being taught in semantics seminars at leading universities. One can also learn a lot about what is currently going on in semantics by following Kai von Fintel's weblog "Semantics Etc." http://semantics-online.org/blog/ .

Yes, I think that Russia is very fertile ground for formal semantics (and I would expect that China would be too.) When I first started teaching here in 1996, I think that neither the faculty nor the students had any idea what formal semantics was, and they were mainly being polite to me because I had a certain amount of name recognition (and because they respected my Russian husband.) But in the ten years that I've been teaching here I have found the students to be increasingly interested in the field and increasingly knowledgeable about it. In 2005, when I was teaching as a Fulbright lecturer at two Moscow universities (MGU and RGGU), a group of my past students organized the "First Annual Workshop on Formal Semantics in Moscow", which they intend to do each year, as an informal forum mainly for students and young researchers to present their work in formal semantics to a supportive audience. Also in 2005, one of the Russian students had a paper presented for SALT for the first time. It's not so surprising that formal semantics found fertile ground among the Moscow linguistics students, since not only has Russia traditionally been strong in mathematics, but mathematics has been a part of the linguistics curriculum both at MGU and at RGGU, which have the two strongest linguistics departments in Moscow.

I found that the students here on average had a much stronger mathematical background than the students I teach at home in Massachusetts; but they did not have a very clear idea of why there was so much mathematics in their curriculum or what they might use it for, and I sensed that they were very happy to be see that mathematics and logic could be used to put semantics onto a more rigorous foundation. And yes, I expect to see formal semantics continue to spread internationally, especially in countries that are strong in mathematics and science. The internet makes everything much more accessible now, and many instructors are putting their course notes online, and many researchers are putting much of their work online. (The lecture notes and assignments for my semantics courses in Moscow can all be found on my website; the two courses from 2005 are at http://people.umass.edu/partee/RGGU_2005/RGGU05_formal_semantics.htm and http://people.umass.edu/partee/MGU_2005/MGU05_formal_semantics.htm.) To find current articles online, the two best places to look are (i) the websites of individual researchers and (ii) the Semantics Archive http://www.semanticsarchive.net/.

Zou: Although there are many students nowadays majoring in linguistics and in logic in Chinese universities, courses on modern logic and mathematical linguistics are not as common in China as in the States, let alone formal semantics courses. As an experienced professor in the UMass, you are an expert in these areas. Can you therefore offer any advice on teaching courses in formal semantics in Chinese universities? Further, can you recommend some useful textbooks and reading materials concerning the field? And, how can we cultivate the teaching faculty in the field? etc.

Partee: I think it would be very natural for formal semantics to flourish in China for the same reasons that it has taken root quickly in Russia. Many of the resources I mentioned above could be very useful for teaching formal semantics in China, and I think it can be done without textbooks if textbooks are not easy to obtain. I normally teach without a textbook in Russia, because western textbooks are still too expensive for the average Russian student. I have typically done a quite a lot of xeroxing for my Russian students, but last year when I was teaching a large class at MGU, and there were too many students for me to make xeroxes of everything for them, I got some students to help me make CDs for everyone with most of the readings I wanted to give them; that was accomplished through a mixture of downloading and scanning and then burning CDs. That required some time on the part of the student helpers, but it was an efficient way to give a lot of students a lot of material, including scanned copies of several important dissertations.

Textbooks can be very valuable, of course. Here are several that I can recommend very highly.

(1) Emmon Bach's informal introduction to the field, which relates some of the more technical material found in other books to more intuitively graspable ideas: (Bach 1989), based on his 1984 series of lectures in China.

(2) (Chierchia and McConnell-Ginet 1990), an excellent introduction that includes a

good balance of semantics and pragmatics, and can be understood by undergraduate students as well as graduate students.

(3) Gamut (1991), two volumes. The first volume is a logic textbook that includes topics particularly relevant to semantics, such as the logic of definite descriptions and presupposition. The second volume can be used as a textbook in formal semantics and its logic (modal and tense logic, the lambda calculus, typed intensional logic), and it is an excellent introduction for those who already have some background in at least first-order logic. For linguistics students who have no background in logic and may be intimidated by it, it is not as good a textbook as Chierchia and McConnell-Ginet unless there is a teacher who is ready to help the students learn the necessary logic at the same time, but for those who come from logic or mathematics, it is probably the best introduction to formal semantics.

(4) (Heim and Kratzer 1998). This textbook is widely used in American linguistics departments. It covers a smaller range of topics than Chierchia and McConnell-Ginet or Gamut, and is in some respects idiosyncratic, but what it covers, it covers with great care, considering alternative possible analyses at every step. It is good for linguistics students who are already motivated to learn formal semantics and want a very thorough grounding in the basics. I wish it had more explicit model theory; that is one defect in the book. There is an emphasis on the syntax-semantics interface, which is missing in the Gamut textbook; the syntax is somewhat Chomskyan, but not extremely so, and I think it can probably be used without presupposing much if any knowledge of syntax. Solutions to some of the problems in the Heim and Kratzer textbook can be found at Rajesh Bhatt's website: http://web.mit.edu/rbhatt/www/24.903/. Kai von Fintel and Irene Heim have a sequel textbook in preparation covering intensionality, and a "lecture notes" version of that textbook is online: http://semantics-online.org/advsem/IntensionalSemantics.pdf . The von Fintel and Heim notes presuppose the Heim and Kratzer book.

(5) A new textbook, (Portner 2004), combines the user-friendliness and accessibility of Bach (1989) with the rigor of Gamut or Heim and Kratzer. I have not yet had occasion to teach from this book, but it looks like a very good one, and it does not presuppose any background in semantics or logic. It discusses some of the philosophical issues behind some semantic debates, includes discussion of alternative approaches to semantics, treats intensionality and the problem of hyperintensionality, discusses pragmatics and its relation to semantics, and includes a good range of exercises with answers to many of them in the back of the book.

(6) There are two other textbooks that I don't know so well, but they are by good people: (Cann 1993, de Swart 1998).

(7) Supplementary resource: Kadmon's introduction to Formal Pragmatics, which contains topics that overlap strongly with semantics and gives a good sense of the interconnectedness of semantics and pragmatics: (Kadmon 2001).

(8) Supplementary resources: (i) (Portner and Partee 2002), a collection of classic papers in formal semantics. (ii) (Lappin 1996), a collection of well-written survey articles in many although by no means all areas of semantics; formal semantics is well-represented but is not the only approach covered. (iii) (van Benthem and ter

Meulen 1997), a larger and more "advanced" handbook with a more strongly logical emphasis.

As for cultivating the faculty in the field, it will be valuable to make opportunities for young scholars to make international contacts, attend international conferences, and publish in international journals. Exchanges in both directions between graduate students, post-doctoral researchers, and young faculty members can be extremely valuable. Since relatively little work has been done on the formal semantics of Chinese (there is some, but the only work I know is Jo-Wang Lin's excellent dissertation from the University of Massachusetts (Lin 1996) and his subsequent work (Lin 1998, Lin 1999, Lin 2003, Lin 2004), and Henrietta Yang's dissertation in progress at the University of Texas (Yang In progress)), you should be able to attract good semanticists from the west interested in working on Chinese with Chinese students, perhaps with the aid of Fulbright grants. It will probably be helpful to have some Chinese students get western Ph.D.s and then return to China; that is one of the best ways to learn the "culture" of the field, something that is difficult to teach explicitly. In any case, if you already have a lot of students studying linguistics and logic in Chinese universities, it should not be difficult to build up the field of formal semantics in China quickly and successfully, and I wish you well! We all know that as soon as China enters the field in a serious way, it will be only a matter of time until many of the best formal semanticists in the field will be Chinese, and we look forward to such an exciting expansion of our field!

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