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Why not the whole iguana? I have no disagreements worth mentioning with Pylyshyn's paper, but would like to explore two comments of his.

"There have been grand theoreticians in psychology in the past (e.g., Freud, James, Hull) who have sought . . . general principles with very limited success," Pylyshyn suggests, because they lacked "a powerful technical tool to discipline and extend the power of the imagination." And now for the first time we have the tool that might permit us to express and test at least *sketches* of unified cognitive theories of whole creatures, the sort of theories to which Freud et al. aspired. Moreover, as Pylyshyn observes, the users of that tool have come to a consensus of sorts that theories of the whole creature are what is needed:

"The recurrence of major problems of organization and representation of knowledge, and the organization and distribution of responsibility or control . . . have produced the growing conviction among cognitive scientists that intelligence is not to be had by putting together language abilities.

sensory abilities, visual abilities, memory, motivation, and reasoning (as the chapters of typical psychology textbooks suggest) but by bringing a large base of knowledge to bear in a disciplined way in all cognitive tasks."

Very true, but then why have cognitive scientists persisted in attempting to model sub-subsystems with artificially walled-off boundaries (not just language understanders, but nursery-story-only understanders, for instance)? Why are they not trying to model whole cognitive creatures? Because a model of a whole human being would be too big to handle: people know too much about too many topics, have too many interests, capacities, modalities of perception and action. One has to restrict oneself to a "toy" problem in a particular domain in order to keep the model "small" enough to be designed and tested at a reasonable cost in time and money. But faced with the conclusions quoted above, why not obtain one's simplicity and scaling down by attempting to model a whole cognitive creature of much less sophistication than a human being? Why not try to do a *whole* starfish, for instance? It has no eyes or ears, only rudimentary pattern-discrimination capacities, few modes of action, few needs or intellectual accomplishments. That could be a warm-up exercise for something a bit more challenging: a turtle, perhaps, or a mole. A turtle must organize its world knowledge, such as it is, so that it can keep life and limb together by making real time decisions based on that knowledge, so while a turtle-simulation would not need a natural language parser, for instance, it would need just the sorts of efficient organization and flexibility of control distribution you have to provide in the representation of world knowledge behind a natural language parsing system of a simulated human agent such as SHRDLU.

Perhaps there are good reasons for not pursuing such projects. I suspect that one of the *real* reasons such projects are not pursued is that in order to design a computer simulation of a turtle you would have to learn all about turtles, and who wants to go to all that trouble, when you already know enough about yourself and your friends (you think) to have all the performance data you need for the human mini-task of your choice? Moreover, only people who also knew a great deal about turtles would be knowledgeable enough to be impressed by your results.

Considering the abstractness of the problems properly addressed in A.I. (Dennett, 1978), one can put this attitude in a better light: one does not want to get bogged down with technical problems in modeling the cognitive eccentricities of turtles if the point of the exercise is to uncover very general, very abstract principles that will apply as well to the cognitive organization of the most sophisticated human beings. So why not then *make up* a whole cognitive creature, a Martian three-wheeled iguana, say, and an environmental niche for it to cope with? I think such a project *could* teach us a great deal about the deep principles of human cognitive psychology, but if it could not, I am quite sure that most of the current A.I. modeling of familiar human mini-tasks could not either.

REFERENCES

- Dennett, D. C. *Artificial Intelligence as Philosophy and as Psychology*. In: M. Ringle (ed.), *Philosophical Perspectives in Artificial Intelligence*. New York, The Humanities Press, 1978.