

JOHN R. SEARLE'S CHINESE ROOM

A case study in the philosophy of mind and cognitive science

John R. Searle launched a remarkable discussion about the foundations of artificial intelligence and cognitive science in his well-known Chinese room argument in 1980 (Searle 1980). It is chosen as an example and introduction to the philosophy of mind. No background knowledge is needed to read this presentation. However, for Finnish readers there is [a small introductory text](#) to the mind-body -problem. You may also read Stevan Harnad's commentary on Searle's arguments and related issues([1989](#) , [1990](#), [1992](#), [1995](#)) and Searle's [replies to them](#). Selmer Bringsjord offers us an [commentary \(1994\)](#) on Searle's philosophy, defending cognitive science.

Mind-body -problem

Thousands of years have scientists thought about the following question: how can we combine mind and brain - two quite distinct entities. At first, this question might appear meaningless, but trust me: it is a hard one, perhaps one of the biggest problems in science today.

Many proposals have been given. **Descartes** suggested that there exists an independent entity - or substance - which is the human soul. The soul interacts with the brain. Today this is not a widely accepted view, but it still has its defenders such as neurobiologist John Eccles. It is called *interactionist dualism* .

Materialism is the doctrine that there are no such things as souls. Only material things exist. However, many forms of materialist positions exist. In this context we will examine only one of them, called *strong artificial intelligence* stating that a computer with the right *program* would be mental. The emphasis is on the word 'program', since any machine can implement a given program. This is an answer to the mind-body -problem: what matters is not the matter but its organisation ie. that it 'runs' the right software.

A human mind is considered as a piece of software which the human brain implements. Therefore it would be possible - in principle - to code this program to a von Neumann computer and we would have a mental machine. This is quite a fascinating position. The whole cognitive science was originally based on this paradigm (classical cognitive science, cognitivism).

Chinese room argument

Searle's Chinese room argument tries to show that strong AI is false. But how can anyone show it to be false if we don't know what the human mind's program is? How can one know *a priori* - before any empirical tests have been given? This is the ingenious part of Searle's argument. The idea is to construct a machine which would be a zombie (ie. not mental) with *any* program. And if this machine would exist, it is the case that strong AI would be false, since no program would ever make it mental.

But how to construct such an machine? And worse than that, how would we actually know if it has thoughts or not? This is the second problem which Searle solves by putting *ourselves* to implement the machine. If we implement the program, we would know if it is mental or not. Therefore the Chinese room argument has a thought experiment part. This is presented next.

Suppose you are in a closed room which has two slots. From the slot 1 somebody gives you Chinese characters which you don't recognize as words ie. you don't know what these small characters mean. You also has a huge rulebook which you use to construct another Chinese characters from those that were given to you, and finally you split these new characters out of the slot 2. In short:

1. Chinese characters comes in,
2. you use the rulebook and construct more Chinese characters and
3. you put those new characters out.

In its essence, this is just like a computer program which has an input, it computes something and finally splits an output. Suppose further that the rulebook is such that people outside this room can discuss with you in Chinese. For example, they send you a question 'how are you' and you, following the rulebook, would give a meaningful answer. So far, the computer program simulates human being which understands Chinese.

One can even ask 'do you understand Chinese?' from the room and it can answer 'yes, of course' despite of the fact that *you*, inside the room, would not understand a word of what is going on. You are just following rules, not understanding Chinese.

The crucial part is this: *given any rulebook (=program), you would never understand the meanings of those characters you manipulate.* Searle has constructed a machine which cannot ever be mental. Changing the program means only to change the rulebook and you can clearly see that it does not increase your understanding. Remember that the strong artificial intelligence states that given the right program, *any* machine running it would be mental. Well, says Searle, this Chinese room would not understand anything... there must be something wrong in strong AI.

Criticism

Searle has presented his views, it is time for other philosophers and cognitive scientists to introduce their comments and criticism. The criticism is presented in a form of a dialogue. Cognitive scientists' comments are grounded on many commentaries on Searle's arguments, and Searle's replies are based on his commentaries on criticism. However, they are fictive.

Cognitive Scientists (CS for no on): I'm impressed. You have surely given an exceptional argument which raises many profound questions concerning the foundations of artificial intelligence. But how can you insist that we can never come up with thinking machines? It might be that our present computers and programs are still too simple (Sloman & Croucher 1980)? Maybe our present computers are just too slow (Dennett 1987)?

Searle: This is not a matter of any machines, future prospects or the speed of your computers. It has nothing to do with the hardware. Strong artificial intelligence says that all that matters is software.

CS: I see your point. But I still find that your Chinese room is not analogous to computers, as you claimed. In fact, you have later written that there is no such thing as an intrinsic syntax in the nature (Searle 1993, Jacquette 1990): why do you postulate that such an entity would exist in computers? Sure, computers are programmed by syntactical programs but in their essence they are just hardware. And a program is transformed to electrical impulses, which is, hardware in your vocabulary. So, I think that the Chinese room argument has nothing to do with computers.

Searle: On that point I was wrong when I first introduced the argument in 1980 (note that this is my interpretation, I think Searle has not admit this). I compared the Chinese room to Roger Schank's computer simulations (1977). However, as I said, my argument has nothing to do with hardware or computers, its about programs. But it still denies strong artificial intelligence, cognitivism and cognitive science.

CS: But the 'intrinsic intentionality' (mentality) you are talking about... it is a private experience... why would we want to introduce any objective criteria for such a subjective experience (Wilensky 1980, Jacquette 1989)? In fact, we have this 'other minds problem' stating that it is ultimately impossible to know that someone else has any subjective experiences. We cannot observe other people's thoughts. I think you want too much - the Turing test (1950) would certainly be enough! I think this doubts the importance of your argument. Whether any machines will be mental, we cannot never know that for sure.

Searle: Agreed. But what's the point in the strong AI then? If the strong AI claims that any system with the right program would be mental, it is clearly a metaphysical hypothesis in the same sense... However, I can present my Chinese room argument without the other minds problem. My argument shows that the person in the Chinese room doesn't understand Chinese. We rely on our *own* experiences when we verify this fact. So, this argument holds whether there are some conscious minds other than me (common sense) or not (solipsism). In that sense, it's about the ontology of mentality, not about epistemology (Searle 1993b). And in cognitive science, one just presupposes that mental minds exist.

CS: Curiously, we still have a feeling that your argument is just a 'intuition pump' of some kind (Dennett, Block, Hofstadter 1980). You have just constructed a purposeful and intuitive situation, aiming at a false conclusion. Think about earth: people were pretty much convinced that it is flat. Nobody believes that today. There we have an example of wrong intuition - maybe that's what Chinese room is all about. Anyway, why should we - as scientists - believe on any intuitions or thought experiments?

Searle: It is a plain fact that I don't understand Chinese in the Chinese room. There is no intuition about that. The argument relies on that *fact*.

CS: Hmmm... You refer to this concept of 'intentionality' in your argument. You are claiming that the man in the room does not have intentionality?

Searle: Right. Since I don't understand Chinese, I don't know what those Chinese characters mean. This means essentially the same as lacking of intentionality. Intentionality, on the other hand, is one essential form of mentality (Brentano).

CS: But isn't it quite problematic to try to distinguish between intentional and non-intentional creatures? What kind of mental states would you postulate to monkeys, cats, insects... (Menzel 1980)? There is perhaps no point in saying that something is mental and something is not?

Searle: My argument has nothing to do with that. I am not trying to find any criteria for mentality.

CS: Yes, but we meant that what if there exists intentionality in some other form (Jacquette 1989, Carleton 1984)? It might turn out that the human intentionality is not the only possibility. For example, in your original article 1980, you said that 1) there are some processes P which produce intentionality, 2) X is intentional and derived from this that X has those processes P. This is plainly a false logical inference.

Searle: Can you show where I did say so?

CS: You wrote (1980) that "it says simply that certain brain processes are sufficient for intentionality" and "any mechanism capable of producing intentionality must have causal powers equal to those of the brain."

Searle: ...well... you are right on that. I made a logical mistake. However, it does not destroy my arguments (1990b) since it has nothing to do with the strong AI thesis. Strong AI thesis states that all that matters is program. They don't distinguish between alien or human intelligence. In fact, I think they are not trying to build a machine with an alien intentionality, it is the human mentality they are after.

CS: What if the whole 'feeling' of intentionality is only a some sort of illusion (Bridgeman 1980, Ringe 1980)?

Searle: Illusion? Don't you have a concrete feeling of being intentional and mental?

CS: Of course, but I asked if it is important in any sense, perhaps it is just an illusion and doesn't exist as we think?

Searle: So? Then strong AI advocates are also talking about some kind of a illusion... it doesn't matter whether it is illusion or not... we are just debating about it. Who cares if it's illusion? And most of all, what a marvellous and wonderful illusion it is! Let us simply say that the intentionality is in fact an illusion, and continue our debate keeping in mind that we are talking about illusions.

CS: Well, ok, just a thought... but you said that this rulebook is so complex and huge that the room can answer meaningfully to any Chinese questions?

Searle: Yes.

CS: So it must be possible for the room to learn?

Searle: Of course.

CS: I think that if the room is able to answer meaningfully to *any* questions, we must simply say that it understands (Rorty 1980). Cheating completely is not cheating anymore! The problem vanishes.

Searle: Going back to Turing's proposal? If you want, you can define the concept of 'understanding' behaviorally. Then, understanding means the same as behaving *as* you would understand. I called this *as-if-intentionality* or *observer-relative intentionality*. It is for that reason we must distinguish between as-if-intentionality and intrinsic intentionality.

CS: Oh, I see... so, Turing was talking about observer- relative understanding?

Searle: Precisely. However, Turing never mentioned anything about understanding. He was talking about intelligence.

CS: These conceptual issues again... is it necessary to say that consciousness and mentality are necessary for intelligence, semantics and intentionality (Korb 1991, Dretske 1990)? I think that even semantics can exist without any conscious 'intrinsic' experience.

Searle: You can say so. But what I mean... I simply don't use these words in that sense...

CS: Yes, I know. Well, I think a killer counterargument has come to my mind... you said that it is a plain fact that the man

in the room does not understand Chinese and therefore he has no intentionality?

Searle: Right.

CS: But isn't it also a fact that he *is* intentional when he uses his rulebook and carries out the orders? He is clearly an other human being (Boden 1988, Chrisley 1995, Rapaport 1986) and one can conclude that even a pure syntactical symbol manipulation would then require intentionality! Chinese room would not work at all if the man dies or becomes unconscious.

Searle: You made a good point. The person is not intentional what comes to Chinese, but of course, he understands something about the rulebook. You are right on that.

CS: So isn't there something quite wrong in your argumentation then? One can conclude, in the same manner as you, that computers need to understand the rules they use in computations...

Searle: From *one* example you cannot infer for *all*. If the man in the Chinese room has intentionality, it does not follow that all computers must have intentionality.

CS: But now you are saying that the man in the room *is* intentional, aren't you?

Searle: In a sense. But he or she does not understand Chinese, and that is the fact we must concentrate on. OK, I have to admit that the thought experiment is naturally such that a person is there with his or her intentionality. But you must realize that this argument is about Chinese, not about understanding the rulebook.

CS: Can you make your point more explicitly? It is no more clear to me what your argument says?

Searle: My argument says... that if there is a entity which does computation, such as human being or computer, it cannot understand the meanings of the symbols it uses. It does not understand the input given or the output splitted out.

CS: Fine. I can accept that, at least temporarily. But how can one be so sure that the room as a whole does not understand? How can you, being only a part of the system, know about the system as whole (Weiss 1990, Copeland 1993, see also Searle 1980). Think about a single neuron in your head. Do you think it is conscious? But however, quite miraculously, the system of many neurons becomes conscious (Dyer 1990). Maybe the understanding is not in the manipulator but in the rulebook (Abelson 1980), or in the researcher how made the rulebook (Schank 1980)?

Searle: If the room keeps bothering you, we can leave it out. Suppose that the man memorizes the whole rulebook and starts working outdoors. There are no differences and no other subparts where the intentionality would mysteriously hide (Searle 1980). And, if the understanding is on the rulebook or in the researcher, you are talking about the *weak artificial intelligence*.

CS: What about the indexicals? If you ask the room "What is this?", he cannot answer. He cannot see it from the rulebook (Carleton 1984, Ben-Yami 1993).

Searle: That assumes that the only input to the machine is language.

CS: So, we must imagine, instead of a passive room, a robot of some kind with perceptions, ability to move, sensor modalities etc. etc. (Bridgeman 1980, Fodor 1980, Boden 1988, Dyer 1990)? A Chinese robot?

Searle: That does not make any difference. When you are sitting in the room and getting meaningless input, you can't even know whether it is language or something else. It is *so* meaningless. It does not matter whether the system is a language speaker or a humanoid Star Wars robot.

CS: I have to admit. But what if we simulate - in the means of computer program - every neuron in our head? I mean *every* neuron in any arbitrary level of detail (Pylyshyn 1980, Bridgeman 1980, Haugeland 1980, Lycan 1980, Hofstadter 1980, Wilensky 1980, Savitt 1981, Jacquette 1989, 1989b, 1990, Dyer 1990)?

Searle: We might get a robot behaving just like us.

CS: But how can you be so sure that it does not have mental life? Think! If we simulate *every* neuron - what could possible be left out? Nothing! There is absolutely everything in that program we can ever need.

Searle: First, I have to say that this idea is quite far from cognitivism and cognitive science where we are not supposed to

simulate brains but minds. That has nothing to do with the original physical symbol system hypothesis.

CS: Of course, but in your original article you said that the Chinese room argument applies to any Turing equivalent computer simulation. Surely this brain-simulation can be Turing equivalent.

Searle: So I said...

CS: Sorry to interrupt, but let me formulate another thought experiment (comes from Savitt 1982). Suppose there are n neurons in your head. Call him *agent* _{n} . Take one neuron from his head and formalize its functioning, and replace the missing neuron with its simulation. Call this agent _{$n-1$} . And you can go on: take another neuron, write down its program and make the replacement. Your Chinese room is agent₀! No neurons are left, there is only one huge program - a simulation of his every neuron. What happens between? Does his intentionality vanish? Does it transfer to the program?

Searle: A nice story. But first, we must distinguish two systems. One with many small demons simulating every neuron and the one where only one demon is running the whole program. My Chinese room is about the latter. The former is another issue. And finally, there is no difference. If you make the rulebook to simulate all neurons, this does not give any sense of intentionality to the manipulator. He cannot even know whether the rules concern stock prizes, language production, neural simulation or anything else. We have to admit that the man in the room cannot understand *whatever the program is*.

The cognitive scientist has failed

Time goes by. Cognitive scientist goes to her chambers and starts to wonder the issue. The man in the Chinese room does not understand... is there any way out of this plain fact? She is feeling depressed, being a defender of strong artificial intelligence and cognitivism. She has done a lifetime job with computer simulations, thinking that some day they would produce mentality. Chinese room seems to be a system which cannot ever be mental.

Then suddenly everything becomes clear. She knows what's wrong with Searle's argument, and why Searle is wrong.

Revenge

Searle: You told me you have another counter-argument dealing with my Chinese room?

CS: Yes I do! And this time you cannot beat me.

Searle: We'll see...

CS: Previously I argued that what if the whole room understands Chinese, and not the person inside it. You replied that the room is unnecessary, and that the man can memorize the rulebook, was this correct?

Searle: Yes, that's what I said.

CS: You also said that then there are no other systems where the intentionality would hide? There is only one person who is manipulating the rules from his memory?

Searle: Right.

CS: There is only one person... however, as we know, persons and brains are not the same thing, are they?

Searle: No, they are not. Brains do not have sensations but persons do. Persons see red colors but brains do not. This is just a conceptual issue here, quite obvious indeed. It has nothing to do with the fact that brains cause persons or that they are identical. In our language we must distinguish between persons and brains. I have said earlier (1992) that those mental, personal phenomena are also irreducible.

CS: Now, you said that the *person* does not understand, but what about his brain?

Searle: ?

CS: Who says that there must be only one person per brain (McDermott 1980, Dennett 1980, McCarthy 1980, Maloney 1987, Cole 1991)? A person cannot report on his brain. For example, you are quite unreliable source of information about your neurons or synapses. Moreover, as you previously replied, if the person memorizes the rulebook and goes outdoors,

there would be no place where the intentionality can hide. My answer is: there is such a place, namely, the person's brain.

Searle: There is no reason to think that there would ever be any another person in my brain than me!

CS: But *in principle* it is possible, isn't it?

Searle: Yes, but...

CS: In philosophy, anything that is possible *in principle* can do.

Searle: What are you suggesting? Are you saying that we cannot rely on the Chinese room since we cannot be - as persons - sure if there is someone *else* in our... head... which would understand Chinese?

CS: Precisely. You are making a sort of categorical mistake (Boden 1988) in this argument, mixing the brain and the mind. In computers, for example, you don't have the person's level as a starting-point. It might only *emerge* in right circumstances. The person in the Chinese room is just not reliable a source of information about this matter.

Searle: But still... I find your speculations quite unconvincing, even if I have to admit that it is possible in principle.

CS: I know. But the best part is still coming.

Searle: Hit me.

CS: There is one way for the man inside the room to learn Chinese.

Searle: What are you waiting? Speak it out!

CS: The man can go outdoors and start to learn, like anybody else. He can just break the walls and meet his programmers.

Searle: What?? But that would violate my argument..! You cannot be serious.

CS: I am deadly serious. OK, I have to admit that it violates your original argument, but *in what way* ? Going out of the room means essentially the same as *changing the causal relations between the person and his environment*. Nothing else happens! He just starts to consider his input in a different way. Why is this so crucial? Because the question was not that the man was doing syntactical manipulation on symbols but that he just had wrong causal relations to his environment (Fodor 1980). Going out of the room fixes those relations and the system learns to understand. As you have previously said, there does not even exist such an entity as pure syntax. It is all about causal relations. Your Chinese room argument is just a curious situation where those causal relations are preset to prevent some kind of learning.

Searle: A nice thought, but isn't it so that any computer is always in the same situation also?

CS: Can you prove that? I mean, that's quite an another argument. Your Chinese room uses human beings which are, in their essence, able to understand if the causal relations are changed.

Searle: But *still* , if some strong AI advocate gives me his ingenious computer program producing mentality, then I can run it in the Chinese room and see that there wasn't any mentality at the first place.

CS: And *still* , you cannot tell about your brain, or some part of it, can it understand, and *still* , there is already intentionality present in that room which causes the system to learn when the causal relations are changed. You simply can't state a proof about the missing mentality if the mentality is in fact not missing.

Searle: Confusing... quite confusing... I thought it was just a plain fact that the man cannot the understand Chinese.

CS: You keep saying that over and over again. But, if there is a man manipulating the symbols, he is intentional already. If there is no man in the room, we cannot know.

Conclusions

I don't know whether the issue is settled down or not. Searle himself is still cheering for his argument. Many are against. I would put the cognitive scientist's last phrase in my own mouth and say that that's why the argument does fail.

References

I now list all articles and books which have something to do with the Chinese room argument. Some of them were referred from the text, some were not. If you want to dig more on this topic, this list would be a good place to start.

- Abelson, Robert P.(1980), Searle's argument is just a set of Chinese symbols, Behavioral and Brain Sciences 3, open peer commentary on Searle.
- Armstrong, D.M.(1968), A Materialist Theory of the Mind, Chaucer Press, Great Britain; revised edition, 1993, Routledge, New York.
- Ben-Yami, Hannoeh (1993), A Note on the Chinese Room, Synthese 95.
- Blackburn, Simon(1994), The Oxford Dictionary of Philosophy, Oxford University Press, New York.
- Block, Ned (1980), What intuitions about homunculi dont show, Behaviour and Brain Sciences 3.
- Block, Ned (1980b), Introduction: What Is Functionalism, In Block, N.(Ed.) Readings in Philosophy of Psychology, vol. 1, Cambridge, Mass.:Harvard University Press.
- Block, Ned (1994), Troubles with Functionalism, The Philosophy of Mind, Beakley Brian & Ludlow Peter (toim.), 1994, 3. painos, MIT Press, London. Alunperin Perception and Cognition: Issues in the Foundations of Psychology, Minnesota studies in the Philosophy of Science, Minneapolis: University of Minnesota Press, vol. 9, 1978, Savage, C.W.(toim.) Kirjoittaja on tehnyt käyttämäni uudenpaan versioon muutoksia alkuperäiseen nähden.
- Boden, Margaret A.(1988), Computer Models of Mind, Cambridge: Cambridge University Press.
- Bridgeman, Bruce (1980), Brains + programs = minds, Behavioral and Brain Sciences 3, open peer commentary on Searle.
- Brinch, Hansen (1973), Concurrent programming concepts, ACM Computing Surveys 5(4).
- Bringsjord, Selmer (1992), What robots can and cant do, Kluwer Academic Publishers.
- Carleton, Lawrence R.(1984), Programs, language understanding and Searle, Synthese 59.
- Chrisley, Ronald L.(1995). Weak Strong AI: An elaboration of the English Reply to the Chinese Room, in (Pylkkänen & Pylkkö, toim.) New Directions in Cognitive Science: Proceedings of the International Symposium, Saariselkä, 4-9 August 1995, Lapland, Finland, Finnish Artificial Intelligence Society: Helsinki.
- Churchland, Patricia S.(1986), Neurophilosophy: Toward a Unified Science of the Mind/Brain, Cambridge: Mt Press/A Bradford book.
- Churchland Paul M.&Patricia Smith (1990), Could a Machine Think?, Scientific American 262 (january).
- Cole, David (1984), Thought and Thought Experiments, Philosophical Studies 45.
- Cole, David (1991), Artificial Intelligence and Personal Identity, Synthese 88.
- Copeland, B.J.(1993), The Curious Case of the Chinese Gym, Synthese 95.
- Dennett, Daniel C.(1978). Brainstorms, Harvester Press: Great Britain.
- Dennett, Daniel C.(1980), The milk of human intentionality, Behavioral and Brain Sciences 3, open peer commentary on Searle.
- Dennett, Daniel C.(1981), Where Am I, in Hofstadter D.R & Dennett D.C.(toim.) The Minds I, New York: Basic Books Inc., 217-231.
- Dennett, Daniel C.(1987), The Intentional Stance, luku 9, Fast Thinking, 323-337, Mit Press.
- Dennett. Daniel C.(1991), Consiousness Explained, London: Butler & Tanner Ltd.

- Dyer, Michael G.(1990), Intentionality and computationalism: minds, machines, Searle and Harnard, *Journal of Experimental and Theoretical Artificial Intelligence (JETAI)* 2:303-319.
- Dyer, Michael G.(1990b), Finding lost minds, *Journal of Experimental and Theoretical Artificial Intelligence* 2:329-339.
- Dretske, Fred (1985), Machines and the Mental, Cole, David J. et al. (toim.) *Philosophy, Mind, and Cognitive Inquiry*, 75-88.
- Dretske, Fred (1990), Machines and the Mental, Cole et al.(eds.) *Philosophy, Mind and Cognitive Inquiry*, Kluwer Academic Publishers, Netherlands.
- Dreyfus, H.L & Dreyfus, S.E.(1988), Making A Mind Versus Modeling the Brain: Artificial Intelligence Back at a Branchpoint, *Daedalus* 177, 15-43.
- Fetzer, James H (1990), *Artificial Intelligence: Its Scope and Limits*, Kluwer Academic Publishers, Netherlands.
- Fodor, J.A.(1980), Searle on what only brains can do, *Behavior and Brain Sciences* 3, open peer commentary on Searle.
- Fodor, J.A.(1986), *Representations*, Bradford Books: USA, 4.painos.
- Harnard, S.(1989), Minds, Machines and Searle, *Journal of Theoretical and Experimental Artificial Intelligence* 1:5-25.
- Harnard, Steven (1990), Lost in the hermeneutic hall of mirrors, *Journal of Theoretical and Experimental Artificial Intelligence* 2:321-327.
- Haugeland, John (1980), Programs, causal powers, and intentionality, *Behavioral and Brain Sciences* 3.
- Haugeland, John (1986), *Artificial Intelligence: The Very Idea*, The Massachusetts institute of Technology, 2.painos.
- Heil, John (1981), Does Cognitive Psychology Rest on a Mistake?, *Mind* 90.
- Hofstadter, Douglas R.(1980), Reductionism and religion, *Behavioral and Brain Sciences* 3.
- Hoover, Stewart V.& Perry, Ronald F.(1989), *Simulation: A Problem-Solving Approach*, Addison-wesley Publishing Company.
- Hyvönen Eero, Karanta Ilkka & Syrjänen Markku (toim.)(1993), *Tekoälyn Ensyklopedia*, Gaudeamus, Hämeenlinna.
- Jacquette, Dale (1989), Searles Intentionality Thesis, *Synthese* 80.
- Jacquette, Dale (1989b), Adventures in the Chinese Room, *Philosophy and Phenomenological Research*, Vol. XLIX, no.4.
- Jacquette, Dale (1990), Fear and Loathing in the Chinese Room, *Philosophical Psychology* 3.
- Jahren, Neal (1990), Can Semantics Be Syntactic?, *Synthese* 82: 309-328. Kluwer Academic Publishers, Netherlands.
- Jefferson, G. (1949), The Mind of Mechanical Man, *British Medical Journal*, vol. I, 1105-1121.
- Kamppinen, Matti (1988), Kognitiivismin ongelmia: representaatio, arkipsykologia ja neuronismi, Hautamäki Antti (toim.) *Kognitiotiede*, Gaudeamus, Helsinki.
- Korb, Kevin B.(1991), Searles AI program, *Journal of Experimental and Theoretical Artificial Intelligence (JETAI)* 1:283-296.
- Lycan, William G.(1980), The functionalist reply (Ohio State), *Behavior and Brain Sciences* 3.
- MacQueen, Kenneth G.(1990), Not a trivial consequence, *Behavioral and Brain Science* 13.
- Maloney, J Christopher (1987), *The Right Stuff*, *Synthese* 70.
- McCarthy, John (1980), Beliefs, machines, and theories, *Behavior and Brain Sciences* 3.

- McDermott, Drew (1982), Minds, brains, programs, and persons, Behavioral and Brain Sciences 2.
- Menzel, E.W.Jr.(1980), Is the pen mightier than the computer?, Behavioral and Brain Sciences 3, open peer commentary.
- Penrose, Roger (1994), Shadows of the Mind, New York: Oxford.
- Putnam, Hilary (1975), Philosophy and Our Mental Life, in Mind, Language and Reality: Philosophical Papers, vol. 2, Cambridge: Cambridge University Press.
- Pylyhyn Zenon W.(1980), The causal power of machines, Behavioral and Brain Sciences 3, open peer commentary on Searle.
- Rapaport, William J.(1986), Discussion: Searles experiments with thought, Philosophy of science 53.
- Rapaport, William J.(1988), Syntactic Semantics: Foundations of Computational Natural Language Understanding, in Fetzer, J.H. (toim.) Aspects of Artificial Intelligence, Kluwer, Dordrecht, 81-131.
- Rakshit, Tommy & Peuhu, Ari(1993), Tekoälyn filosofia, Hyvönen et al. (toim.) Tekoälyn Ensyklopedia, Oy Gaudeamus Ab, Hämeenlinna.
- Ringe, Martin (1980), Mysticism as a philosophy of artificial intelligence, Behavioral and Brain Sciences 3.
- Rorty, Richard (1980), Searle and the special powers of the brain, Behavioral and Brain Sciences, 3, open peer commentary on Searle.
- Russel, Stuart & norvig, Peter (1995), Artificial Intelligence: A Modern Approach, Prentice Hall.
- Savitt, Steven F.(1982), Searles demon and the brain simulator, Behavior and Brain Sciences 5.
- Schank, Roger C.(1980), Understanding Searle, Behavioral and Brain Sciences 3, open peer commentary on Searle.
- Schank, R.C. & Abelson, R.P.(1977), Scripts, plans, goals and understanding. Hillsdale, N.J., Lawrence Erlbaum Associates Inc.
- Searle, John R.(1979), What Is an Intentional State?, Mind 88, 74-92.
- Searle, John R.(1980), Minds, Brains, and programs, The Behavioral and Brain Sciences 3, 417-457.
- Searle, John R.(1982), The Chinese room revisited, Behavioral and Brain Sciences (5)2.
- Searle, John R.(1989), Consciousness, uncounciousness, And Intentionality, Philosophical Topics 17, 193-209.
- Searle, John R.(1990), Is the Brains Mind a Computer Program?, Scientific American 262 (January).
- Searle, John R.(1990b), The causal powers of the brain: The necessity of sufficiency, Behavioral and brain sciences 13:1.
- Searle, John R.(1993), The Rediscovery of The Mind, Cambridge: MIT Press.
- Searle, John R.(1993b), The Failures of Computationalism, Think 2.
- Sloman Aaron & Croucher Monica (1980), How to turn an information processor into an understander, Behavior and Brain Sciences 3, open peer commentary on Searle.
- Smythe, William E.(1980), Simulation games, Behavioral and Brain Sciences 3, open peer commentary on Searle.
- Stillings Neil A, Weisler Steven E., Chase Christopher H., Feinstein Mark H., Garfield Jay L., Rissland Edwina L.(1995), Cognitive Science: An Introduction, Cambridge, Mass.: MIT Press
- Turing, A.M.(1950), Computing Machinery and Intelligence, Mind, vol.LIX, No. 236.
- Weiss Thomas (1990), Closing the Chinese Room, Ratio, III 2.

Weizenbaum, J.(1965), Eliza - a computer program for the study of natural language communication between man and machine. Communication of the Association for Computing Machinery 9:36-45.

Wilensky, Robert (1980), Computers, cognition and philosophy, Behavioral and Brain Science 3.

Winograd, T.(1973), A procedural model of language understanding, Computer models of thought and language, ed. R. Schank & K. Colby, San Francisco, W. H. Freeman.

von Wright, G.H. & Anscombe, G.E.M (1988) (toim.), Ludwig Wittgenstein: Huomautuksia psykologian filosofiasta I, WSOY: Juva, §350-.

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(characters appearing in the background are not Chinese but Japanese.)