HAL vs. Poole, 2001 -- Artificial Intelligence and Foreign Language Learning

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Introduction

In 1968 Stanley Kubrick's film *2001 : A Space Odyssey* took the world by surprise. It also provided an ideal towards which computer engineers might strive in designing their programs. Today the model of HAL as portrayed in Kubrick's film is no more a reality than it was then. However certain examples found in the screenplay provide insights for teaching foreign languages. This paper focuses on one small aspect of the *Space Odyssey* story, examining the ramifications of the game of chess and the way it was portrayed in the film version of *2001*.

The discussion begins with computer intelligence and relates this to aspects of foreign language learning by humans. In the course of the discussion, I will touch on two opposing theoretical aspects of Artificial Intelligence; one argues in favor of computer intelligence, the other argues against it. Then I will give an example which demonstrates the current realities of programming.

The concept of computer emotions is much more difficult to grasp, as it carries a certain ambiguity. In order to clarify the issues, I will again draw upon two opposing theoretical points of view, one of which advocates computer emotions; the other disclaims the possibility. Again, an example will serve to show the current realities.

Finally, I will relate the issues of intelligence and emotions to the art of foreign language teaching. Definite analogies can be drawn, and suggestions for improving language classes become possible. In conclusion, we will see that HAL provided a goal for computer design, but his behavior (that is, his *normal* functions) demonstrated very human-like emotions that can be emulated in the foreign language classroom.

The Novel, by Arthur C. Clarke

The following excerpts from Arthur C. Clarke's 1968 novel contain a well thought-out blend of truth and fiction.

The sixth member of the crew cared for none of these things [looking back at the moon-lit earth through a telescope], for it was not human. It was the highly advanced HAL 9000 computer, the brain and nervous system of the ship.

HAL (for *Heuristically* programmed *AL*gorithmic computer, no less) was a masterwork of the third computer breakthrough. These seemed to occur at intervals of twenty years, and the thought that another one was now imminent already worried a great many people.

The first had been in the 1940s, when the long-obsolete vacuum tube had made possible such clumsy, high-speed morons as ENIAC and its successors. Then, in the 1960s, sold-state microelectronics had been perfected. With its advent, it was clear that artificial intelligences at least as powerful as Man's need be no larger than office desks - if one only knew how to construct them.

Probably no one would ever know this; it did not matter. In the 1980s, Minsky and Good had shown how neural networks could be generated automatically - self-replicated - in accordance with an arbitrary learning program. Artificial brains could be grown by a process strikingly analogous to the development of a human brain. In any given case, the precise details would never be known, and even if they were, they would be millions of times too complex for human understanding.

Whatever way it worked, the final result was a machine intelligence that could reproduce - some philosophers still preferred to use the word "mimic" - most of the activities of the human brain, and with far greater speed and reliability. It was extremely expensive, and only a few units of the HAL 9000 series had yet been built; but the old jest that it would always be easier to make organic brains by unskilled labor was beginning to sound a little hollow.

The first generations of computers had received their inputs through glorified typewriter keyboards, and had replied through high-speed printouts and visual displays. HAL could do this when necessary, but most of his communication with his shipmates was by means of the spoken word. [Frank] Poole and [Dave] Bowman could talk to HAL as if he were a human being, and he would reply in the perfect idiomatic English he had learned during the fleeting weeks of his electronic childhood.

Whether HAL could actually think was a question which had been settled by the British mathematician Alan Turing back in the 1940s. Turing had pointed out that, if one could carry out a prolonged conversation with a machine - whether by typewriter or microphones was immaterial - without being able to distinguish between its replies and those that a man might give, then the machine was thinking, by any sensible definition of the word. HAL could pass the Turing test with ease. (1)

The Film, directed by Stanley Kubrick

In his novel, Clarke suggests that HAL can think, but Stanley Kubrick takes this question one step further : does HAL have feelings? The 1968 film begins with monkeys encountering the Monolith, cutting to space transit, then to men encountering the Monolith on the moon, eventually focusing on the Jupiter Mission. There, in an economical sequence of film scenes, Kubrick spells out the A.I. problem.

1. BBC News interviews HAL, asking whether the Series 9000 has ever made a mistake. The answer is negative. Then the newscaster turns to the two non-hibernating members of the crew. Question : Does HAL have feelings? Answer : It's hard to tell.

2. Frank Poole's parents send a birthday transmission. Afterwards, HAL wishes Frank happy birthday. This normally indicates feelings, in human-to-human interactions. Thus HAL tries to assume the role of the absent parents.

3. HAL defeats Frank Poole in a game of chess, an intellectual game. The game etiquette used by HAL produces the illusion that he has feelings.

4. HAL asks Frank (he always calls the crew members by their given names, adding to the illusion of familiarity) to show him the sketches he has made of the hibernating crew members. Then HAL asks Frank a "personal" question concerning the secrecy of mission preparations. Evaluation : if the objective of the mission will adversely affect humans, then the human crew members pose a threat to the mission. HAL is capable of carrying out this mission without them. Therefore his solution is to terminate all five humans on board.

5. HAL fabricates an imminent systems failure. When Bowman and Poole retrieve the "faulty" apparatus, test it, and prove that it is functioning properly, they check with ground control. "Houston" reports that the Series 9000 twin has found nothing wrong with the instrument. Bowman and Poole suspect that HAL is malfunctioning, slip into the pod to discuss disconnecting his "higher intellectual functions," but HAL reads their lips.

6. Frank Poole goes to replace the operational unit of the satellite dish. HAL commandeers his pod and uses it to kill Poole, hurtling his body into space.

7. Dave Bowman takes another pod to try to recover the body. (While Dave is away, HAL terminates the life functions of the three hibernating crew members.) However HAL won't let him back into the *Discovery*. He says he saw Dave talking with Frank about disconnecting him. Dave says he will go back in by the escape hatch, but HAL reminds him that he forgot his space helmet. Dave dives back into the *Discovery* in a dangerous last-ditch attempt at survival.

8. Bowman proceeds to lobotomize HAL, who protests, "I realize things have not been quite right with me. I'm feeling better now. I'm afraid. I'm losing my mind... I can feel it."

9. Left alone aboard the *Discovery*, Dave Bowman sights the Monolith and takes a pod to in-

vestigate. Then ensues the famous *"son et lumière"* finale of the film, an onrush of blurred city nightscapes, color-negative grand canyons and galactic lava lamps, accompanied by Georgy Ligeti's eerie vocal score. After an excruciating transformative journey Bowman ends up in the Louis XIV chamber, viewing himself (plus at various times the pod or the Monolith) at the different stages of his own life. Ultimately the Star-Child emerges.

Discussion

In *2001 : A Space Odyssey*, several key questions are raised concerning Artificial Intelligence (A.I.), the most basic of which addresses the issue of whether computers can think. Arthur C. Clarke suggested that this question was "answered" in 1950 by Alan Turing. However, the philosophical proof that "computers can think" introduces several further questions, such as "if so, *how* do computers think?" and "how does computer intelligence relate to human intelligence?"

A natural extension of the latter question brings us into the realm of human emotions. Here Stanley Kubrick picks up the torch and asks whether computers have feelings. Again this opens up other questions, such as "if so, *what* feelings?" "How do these feelings relate to human emotions?" and "Can a computer evoke feelings from humans?"

Let us first turn our attention to the cognitive aspect of A.I., examining the reasoning of Alan Turing, John Searle and Umberto Eco. From there we can proceed to the affective domain, where Geoffrey Jefferson, Daniel Goleman, Robert LeDoux and Marvin Minsky offer insights on the subject.

1. Computers can think

a. The Turing Test

In his 1950 article entitled "Computing Machinery and Intelligence," Alan Turing proposes a philosophical "proof" that computers can think. He begins with what he calls the "Imitation Game," a party game in which a man and a woman are seated in a room, and an interrogator in another room tries to guess which is which by means of electronically transmitted questions and answers. Turing's "proof" follows from his hypothetical replacement of either the man or the woman by a machine. The "Turing test" (a term coined by Clarke) claims that if a computer can successfully impersonate a human being during a free-form exchange of text messages, then that computer should be considered intelligent. (2)

Turing had worked with many of the leading British chess players in developing code-breaking methods during the Second World War. He also used chess as a platform for working out his early ideas on computers. Here is his imaginary conversation with a "talking computer" :

Q : Do you play chess?

A : Yes.

Q : I have my King at my King 1, and no other pieces. You have only your King at King 6 and your Rook at Rook 1. It is your move. What do you play?

A : Rook to Rook 8. Mate.

Turing suggests that the question and answer method is suitable for introducing almost any field of human endeavor. However he cautions against making unreasonable demands on the computer's performance. "We do not wish to penalise the machine for its inability to shine in beauty competitions, nor to penalise a man for losing in a race against an aeroplane. If the man were to pretend to be the machine he would be given away at once by slowness and inaccuracy in arithmetic." In describing how machines "think," Turing suggests that computers may "carry out something which ought to be described as thinking but which is very different from what a man does... when playing the 'imitation game' the best strategy for the machine may possibly be something other than imitation of the behaviour of a man" (pages 434-55).

b. The Chinese Room

In 1980 John Searle reversed the Turing test, offering philosophical "proof" that machines could *not* think. In the Chinese Room experiment, a computer is fed questions in Chinese, which it matches against a database in order to supply a response. The answers are indistinguishable from those of a human native speaker of Chinese. Searle say that the computer does not understand Chinese; it merely follows a stimulus-response formula that allows it to mimic human responses.

There is also a human version of the Chinese Room. In this experiment, a human being sits in a room with a "database" of books. Someone feeds the questions in through a slot in the wall, and the person sitting in the room looks up the answer. Then he passes the answer out through another slot. For example, if someone slipped a piece of paper containing a phrase from Lao Tsu's *Tao Te Ching* into the room, the person sitting there would (in time) find that the correct response to the question「什麼帶來快樂」"What brings happiness?" would be「爲天下式」"Be the stream of the universe." Again, the native speaker of Chinese would be fooled into thinking that the person in the room understood Chinese.

The common rebuttal to this argument is that even though the individual parts of the room (input, human, database, output) do not know Chinese, the system (that is, the sum of the parts) *does*. (3) Moreover, the database would have to be more than a good dictionary (it would arguably have to include all books ever written in Chinese).

I admit that I do not know Chinese, but scrutiny of this question (see part c, below) reveals that its supposedly "correct" answer does not appear to be based on grammatical logic. I asked a native Chinese informant, who reported that the English equivalents were approximately correct, but a lot of mental gymnastics evidently came into play in arriving at that conclusion. The sagacious answer to this question does not emerge from any set of rules; it emanates from the Old Chinese Guy, sitting around, uttering wisdom. In fact, finding such an answer requires that the whole of the system be more than the sum of its parts. In other words, it would have to be human.

c. Mouse or Rat?

Umberto Eco (2003), addressing the problem of ambiguity of meanings in translating from one language to another (which in fact is what we are discussing here - translating from computer language to English), believes that translation entails both synonymity (a = alpha, b = beta, et cetera) and equivalence in meaning (alpha-beta refers to the first two letters of the Greek alphabet, and not to an American supermarket chain). "Let us assume," he writes, "that synonymity exists, that equivalence in meaning is a value rigidly established by a linguistic convention, and that a machine can be provided with rules that allow it to operate according to that convention, so that it can switch from one symbol to another even though it does not understand the meaning of these symbols" (p. 10). Only then would translation be possible.

Eco points out that the words nephew, niece and grandchild all translate into *nipote* in Italian. On the other hand, the three English words could be broken down into six different categories (in a hypothetical "jungle language"), such as "son of sister," "daughter of sister" etc. In fact Eco does not carry his own example far enough; one could distinguish between "son of son" and "daughter of son," and so on, which would make for a total of *eight* different family relations. Of course this example could be carried much further, extending it to "eldest son of youngest son" and so forth, *ad absurdum*.

"The challenge for a translator," Eco writes, "when two languages seem to have a different segmentation of the content continuum [as in the *nipote* example above], is to make a reasonable conjecture about the content space covered by a homonym term in a given context" (p. 25).

Eco performs a little experiment by submitting a famous passage from the *Bible* (Genesis 1) to an online translation service (AltaVista). He has the computer translate this passage from English to Spanish and back to English again. Then he does the same with English - German - English. Numerous problems arise, most involving mistakes in determining the part of speech (noun, adjective, etc.) of a word, but sometimes the problems concern larger aspects of knowledge, which a computer programmed to perform word-for-word translation cannot be expected to know. Eco concludes, rather simplistically, that "in order to translate, one must know a lot of things, most of them independent of mere grammatical competence" (pp. 17 – 18).

In order to empirically verify the supposed abilities of computers to "think," I tried to replicate Eco's translation experiment. Instead of translating the *Bible*, I asked AltaVista to translate "What brings happiness? Be the stream of the universe" (from the Chinese Room argument) into Chinese and Japanese, it returned the following :

English	Chinese	Japanese
What brings happiness?	什麼帶來幸福.	何が幸福を持って来るか。
Be the stream of the universe.	是宇宙的小河。	宇宙の流れがありなさい。

When the original Chinese sentences from the *Tao Te Ching* were translated first into English, then from English into Japanese, the following results obtained :

Chinese	English	Japanese
什麼帶來快樂	Any brings joyfully	嬉しく持って来る。
爲天下式	( ) world type	?worldのタイプ

Though the computer seems to translate the English sentences accurately, communication breaks down when it is asked to translate the original Chinese. This indicates that whoever translated the *Tao Te Ching* into English for Searle took certain liberties, knowing that "bring" is almost always used in a transitive sense, arriving at a reasonable nominal equivalent of "joyfully" (i.e., "happiness"), although "joy" may have been a more obvious conclusion. "Be the stream of the universe," however, presents special problems. Is this sentence meant to be imperative or indicative? Does the translator wish to say, "It is the stream of the universe"? This choice, although not grammatically logical, would make much more sense in the question-and-answer format that we have before us. The most striking conclusion drawn from this example is that a human is still much more capable of translating even short sentences than a computer.

In order to understand a language, a computer must be able to grasp the meanings of words and sentences. If it can understand a sentence like "It will rain tomorrow," it can have beliefs ("I believe that it will rain tomorrow"), hopes ("I hope that it will rain tomorrow") and fears ("I'm afraid that it will rain tomorrow"). Things that have mental states such as belief, hope and fear are said to have a *mind*. The theory known as "functionalism" allows that computers can have minds if they can pass a performance test, such as the Turing test. In the "computational theory of mind," a variation of functionalism, such mental states are analogous to the workings of a computer. Your brain is the hardware and your mind is the software. John Searle rejects functionalism and argues that no machine could be capable of truly understanding language. Umberto Eco points out that in natural languages, a single word may possibly represent several different concepts, and machines are incapable of determining which meaning fits which context. Can computers think? Based on the above discussion, we may be able to answer "Yes," but it would be a qualified "Yes," and even then there would always be those who would question whether "yes" means the same in English (yes), Chinese (是), Japanese (はい), and COBOL (right).

2. Computers have feelings

In the film version of *2001 : A Space Odyssey*, Kubrick extends "thinking" to "feeling." In order to make a reasonable analogy with a "thinking computer," the question of whether a computer "has feelings" would also need to be tested. It seems unlikely, however, that one could devise a free-form exchange of emotions, as in the Turing test of computer intelligence. (Imagine sitting in a room. A computer passes electronic messages that say "I love you" through a slot. How would you respond? With an e-Valentine? With a "Dear HAL" letter?)

a. Emotions Reserved

Turing discounted the possibility of computers having feelings. In fact in his 1950 article, Turing listed "feelings" among several objections to his own proof, objections he proceeded to refute. These objections included the argument from consciousness, arguments from various disabilities, and the argument from informality of behavior. (5)

Professor Geoffrey Jefferson, in his Lister Oration for 1949, argued that "Not until a machine can write a sonnet or compose a concerto because of thoughts and emotions felt, and not by the chance fall of symbols, could we agree that machine equals brain - that is, not only write it but know that it had written it. No mechanism could feel pleasure at its successes, grief when its valves fuse, be warmed by flattery, be made miserable by its mistakes, be charmed by sex, be angry or depressed when it cannot get what it wants." Further objections hold that "you will never be able to make a computer be kind, resourceful, beautiful, friendly, have initiative, have a sense of humour, tell right from wrong, make mistakes, fall in love, enjoy strawberries and cream, make someone fall in love with it, learn from experience, use words properly, be the subject of its own thought, have as much diversity of behaviour as a man, do something really new." Thirdly, "it is not possible to produce a set of rules purporting to describe what a man should do in every conceivable set of circumstances... To attempt to provide rules of conduct to cover every eventuality... appears to be impossible" (pp. 446-452).

For centuries, psychologists have searched for ways to explain our everyday mental processes – yet many thinkers today still believe that minds are made up of ingredients that can only exist in living things, that no machine could feel or think, worry about what might happen to it, be conscious of its own existence – or could ever develop the kinds of ideas that could lead to creating great sonnets or concertos.

In his book *Emotional Intelligence* (1997), Daniel Goleman defines E.I. in terms of self-awareness, altruism, personal motivation, empathy, and the ability to love and be loved by friends, partners, and family members. Furthermore, Goleman explores the biological patterns of emotional response and shows how the rational and emotional minds can work in harmony. He attempts to understand feelings as they happen and how to manage emotions. Goleman explains how lapses in emotional skills can be remedied. Many of the topics in this book help to explain why our emotions create various responses and how we can adapt, or move from one emotional state to another quite quickly with very minimal effort. However, Goleman seems to avoid the concept of religious sins (apathy, gluttony, greed, jealousy, lust, pride, procrastination, and sloth) and virtues (ambition, bravery, broadmindedness, cordiality, dedication, decisiveness, economy, fairness, generosity, grace, gratitude, humbleness, impartiality, industry, integrity, loyalty, magnanimity, patience, perseverance, punctuality, respectability, self-esteem, sincerity, straight-forwardness, thoughtfulness, transparence). Perhaps virtue and vice represent still another, third dimension of human thought.

b. The Emotion Machine

There is a view in which emotions add extra features to ordinary thoughts, much as artists use colors to augment the effects of black-and-white drawings. Joseph Ledoux, in *The Emotional Brain* (1996), argues that emotional states are not especially different from the processes that we call "thinking." Instead, emotions are certain ways to think that we use to increase our resourcefulness. This variety of ways to think is a substantial part of what we call "intelligence" and applies not only to emotional states but also to all of our mental activities.

Ledoux posits that we are born with many mental resources. We learn more from interacting with others. We learn to think on multiple levels, and we accumulate huge stores of commonsense knowledge. We switch among different modes of thought. We find multiple ways to represent things and build multiple models of ourselves. Emotions are different ways to think. He suggests that we try to learn how human brains might work in order to design machines that can feel and think. Then we can try to apply those ideas both to understand ourselves and to develop Artificial Intelligence.

Marvin Minsky, of M.I.T. (mentioned in Clarke's novel, he also served as a technical advisor on the set of *2001*) sums up current realities in *The Emotion Machine* (2006). "Today many [computer] programs do outstanding jobs... efficiently and reliably. Some of them can beat people at chess... Yet others can recognize pictures of faces... Then why cannot our computers yet do so many things that people can do? Do they need more memory, speed, or complexity? Do they use the wrong kinds of instruction-sets? Do their limitations come from the fact that they only use zeros and ones? Or do machines lack some magical attribute that only a human brain can possess? ...we usually give a present-day program only the knowledge we think it will need to solve each particular problem. In contrast, every normal child learns millions of fragments of knowledge and skills that people regard as 'obvious,' [for example] people usually go indoors when it rains (because they do not like to get wet) ... [However] a typical [computer] program will simply give up when it lacks some knowledge it needs – whereas a person can find other ways to proceed. We should program computers with some of the tactics that people can use when we don't already know just what to do – for example, by making useful analogies." (6)

3. Computer Chess : Thinking + Feeling

Clarke mentions the chess game as a means of entertaining the non-hibernating crew members : "For relaxation he [Poole] could always engage HAL in a large number of semi-mathematical games, including checkers, chess, and polyominoes. If HAL went all out, he could win any one of them; but that would be bad for morale. So he had been programmed to win only fifty percent of the time, and his human partners pretended not to know this" (p. 127).

In the film version, Kubrick includes part of a game, accompanied by the dialogue between HAL and Frank Poole, to illustrate this point :

Poole : Umm... anyway, Queen takes Pawn.
HAL : Bishop takes Knight's Pawn.
Poole : Lovely move. Er... Rook to King One.
HAL : I'm sorry, Frank. I think you missed it. Queen to Bishop Three. Bishop takes Queen. Knight takes Bishop. Mate.
Poole : Ah... Yeah, looks like you're right. I resign.
HAL : Thank you for an enjoyable game.
Poole : Yeah. Thank you. (7)

This dialogue would not be termed a "conversation" (an oral exchange of sentiments, observations, opinions, or ideas) in the strict sense. Rather, it is an oral appendage to a game in which players take turns moving pieces on a board. Appendages of this sort are often used to describe moves in games played via the telephone, where players cannot see each other's playing boards. This particular dialogue is given for the benefit of the viewing audience, who cannot see the chess board onscreen very clearly. It would probably not take place in an actual game between a computer and a man. (8)

In order to understand how this dialogue illustrates the idea of a computer that not only thinks but has feelings, let's separate the bits of game etiquette from the game descriptors (the numbers in parentheses refer to the sequential moves in the game, beginning at move number 14a, White to move) :

Game Etiquette	Game Descriptors	
Poole : Umm... anyway,	Queen takes Pawn.	(14a)
HAL :	Bishop takes Knight's Pawn.	(14b)
Poole : Lovely move. Er...	Rook to King One.	(15a)
HAL : I'm sorry, Frank. I think you missed it.	Queen to Bishop Three. Bishop takes Queen. Knight takes Bishop. Mate.	(15b) (16a) (16b)
Poole : Ah... Yeah, looks like you're right.	I resign.	
HAL : Thank you for an enjoyable game.		
Poole : Yeah. Thank you.		
(28 - 2 words)	(24 + 2 words) (9)	

Notice the location in the dialogue of HAL's decision to disclose the outcome (he is a computer and could have done this at almost any point in the game). Why wait until now (after 15a)? Disclosure takes the form of "playing into the future" of the game, making move 15b, predicting White's move (16a) and Black's subsequent move (16b), resulting in "mate."

Notice also the change in reference from third person to first person, possibly functioning as a "coda," bringing the players back into the here and now. (10)

I submitted this dialogue to AltaVista, once again hoping to replicate Umberto Eco's experiment. My first attempts to translate "Ah..." resulted in the computer returning "ampere hours" or variations on an abbreviation (A.H.). However, the verbal pause filler "Ah" was delivered orally, which would not have been misunderstood by HAL, as it was when the written letters "Ah." were entered into the AltaVista program. Presumably HAL would have been programmed to understand the game etiquette and game descriptors used by Poole; AltaVista was not programmed for the game of chess. Appendix 1 shows the translation from English to Japanese, and the back-translation into English.

4. Artificial Intelligence and Language Learning

In learning a foreign language, the "activity plus object" format provided by a chess game (or the like) can be extremely useful. Whereas most conversations require the interlocutors to construct mental pictures of the topic at hand, a visual object that requires manipulation provides ready-made material to stimulate the conversation.

a. On thinking. The Turing Test offers a highly theoretical "proof" that computers can think. On the other side of the coin, Searle's Chinese Room offers an equally convincing argument that computers cannot think. Which shall we believe? Umberto Eco, assessing the current (post-HAL) state of affairs, demonstrates the magnitude of the gap between contemporary realities and the Clarke-Kubrick vision of 1968 (see Appendix 2 for further details). (11)

What lessons do we have to learn by studying Artificial Intelligence in relation to language learning? Is computer programming analogous to certain methods used in teaching foreign languages? What difficulties would we encounter in making such a comparison? For instance, how would we deal with Krashen's (1981) concepts of language *acquisition* as opposed to language *learning*, applied to a digital framework? Is there a left-brain / right-brain equivalent in the silicon world? How about motor skills? Could we program a computer using Asher's Total Physical Response technique? Recently I have seen a robot playing a violin (rather nicely, I might add), decidedly a major step towards machines' developing motor skills. However many students in Japanese universities make exactly the same mistakes as the AltaVista program, i.e., mistranslating parts of speech and misunderstanding homonyms due to different segmentation of the content continuum.

b. On feeling. Whether or not a computer could ever truly "emote" is another question altogether. Kubrick's terrifying portrayal of a machine whose behavior takes a sinister, deadly turn in the depths of space sends chills down all of our spines. In the final analysis, HAL's logic (envisioning human frailty as a guarantor of mission failure) overcame his fabricated image of being a "feeling" personage, enabling him to commit a cold act of mass murder. However, the sentiments set forward by Jefferson, LeDoux, and Goleman raise certain questions pertaining to human emotional intelligence. Do emotions trump intelligence? Are emotions simply a higher level of intelligence? If so, would it be plausible ultimately to design multi-dimensional computer programs that enable computers to "feel," thus overcoming this fundamental flaw in HAL's program?

This raises the point of whether it is necessary for emotional states to enter into the foreign language classroom. Surely many teachers use emotional devices as teaching tools. If language reflects our abilities to think, then there must also be a dimension of language that reflects our abilities to feel. Perhaps our language course levels should no longer be classified as "beginner / false beginner / intermediate / high intermediate / advanced," but rather "thought / emotion / wisdom," thereby bringing language-teaching methodology into the (post-HAL) computer age.

c. On speaking. No computer has ever achieved the haunting efficacy of HAL, stunningly portrayed by Douglas Rain. HAL's quiet, effeminate mastery (not to mention his mutiny) of the *Discovery* gives the impression that he possesses human-like emotions. At the same time, his evenly paced speech, devoid of pause fillers, gives us the sense that he is somewhat superhuman. (His one lapse in programming, ignorance of the idiom "to read one's lips," gives a prophetic hint at the future "Indianization" of the computer industry.) Yet throughout most of the film his apparent function is that of an instrument, ostensibly subject at all times to the commands of the human crew of the space ship *Discovery*.

In the foreign language classroom, do students have the ability to speak as well as HAL? (I.e., can they follow instructions?) Should students imitate HAL in trying to learn a foreign language? By all means. What he has to say, how he says it, how he makes his audience believe he has feelings by interacting with them on topics that he knows are dear to their hearts, his techniques of conversation management, all offer viable models for emulation by foreign language students. Not that all students should strive to become robots. Rather, students should speak clearly, intelligently, with meaning and substance, demonstrating the confidence and perceived humanity of the HAL 9000 series. Throughout *2001*, HAL gives an impressive example of A.I. as analogous to foreign language learning.

Conclusion

With Stanley Kubrick's *2001 : A Space Odyssey* key questions are raised concerning artificial intelligence. "Can a computer think?" seems to be taken for granted. "Can a computer tell one human from another?" is answered in the affirmative. (12) "Can a computer feel?" is left unanswered, though HAL would have his human shipmates believe it. Regardless, HAL has become a role-model for the development of Artificial Intelligence; indeed, he set the stage for much of the A.I. discussion that has taken place during the four decades since this film was released in 1968.

In a sense, the entire film is an essay on what it means to be human. The Monolith effects evolution, transforming humanoids into what we are today. Moon-Watcher discovers a tool, then uses his tool as a weapon. HAL uses language as well as tools as weapons. In the end the Monolith once again effects evolution, with Star-Child emerging as the next generation of thinking, feeling, speaking, ~~weapon-wielding~~ *advancing* post-humans. Where will it all end?

All's well that ends well. If only foreign language students could learn to speak as well as HAL. Granting an interview. Extending birthday greetings. Playing a game. Asking someone's opinion. Evaluating a situation. Identifying a problem. Denying a request. Justifying unorthodox behavior. Protesting violation. These are representative samples of human verbal behavior. In a land of talking refrigerators and trucks that tell you when they are backing up or turning, introducing a bit of A.I. into the foreign language classroom may not be a bad idea after all.

Notes

(1) Arthur C. Clarke, 1968, pp. 116-119.

(2) Today this game is replicated at California State University, San Marcos (near San Diego). Five human "confederates" mingle with computers in a three-hour online chat session, and a team of ten judges must decide which is which. The winner is the computer program that can pass the Turing test.

(3) In the early 1970s Marvin Minsky and Seymour Papert, working at the MIT Artificial Intelligence Lab, formulated The Society of Mind theory. The theory attempts to explain how intelligence could be a product of the interaction of non-intelligent parts. Minsky developed the theory while trying to create a machine that uses a robotic arm, a video camera, and a computer to build things with children's blocks. In 1985 Minsky published a comprehensive book on the theory.

(4) チェックメート = checkmate　　pawn - 担保 - mortgage
mate - 仲間 - companion　　pawnshop - 質屋 - pawnbroker

(5) Alan Turing, 1950.

(6) Marvin Minsky, 2006, Ch. 6

(7) Excerpted from Roesch vs Schlage, Hamburg, 1913. The chess board has 64 squares, labeled a-h horizontally and 1-8 vertically. In move 12a, White has just taken the Black Rook, Q to a8, which was the losing move. In move 12b, Black moves deep into White ter-

ritory, Q to d3. White moves his Bishop down to d1, and Black moves his Bishop to h3. White is in serious trouble. "Um... anyway" (Q to a6) indicates no further attempt to avert the danger posed by the Black Queen. (Alternative descriptors use the starting positions of the pieces to identify positions, e.g., "Rook to King One," "Queen to Bishop Three.")

(8) The program on my computer, "WinChess" by Frank Norris, offers no such luxury. I have to keep on my toes to see where my opponent has moved.

(9) If "Umm... anyway" are perceived as Game Descriptors instead of examples of Game Etiquette (the move results from a bad tactical decision), there is an equal balance of 26/26 words on each side. (Toastmasters International would have a field day with this dialogue, which boasts three flagrant violations of the "Ah Counter" rule.)

(10) We miss the non-verbal gesture of tipping over one's King to indicate withdrawal from the game. If *HAL* were to lose, would he perhaps say "King to Supine" instead of "I resign"?

(11) While Bowman is dismantling HAL's cognitive functions, HAL begins singing. "Daisy Bell," composed by Harry Dacre in 1892, is renowned as the arrangement that was programmed for an IBM 704 computer to "sing" in 1962. Arthur C. Clarke happened to be visiting the Bell Labs Murray Hill facility during that demonstration of speech synthesis, and was greatly impressed. In the film version of *2001*, Douglas Rain performs the *a cappella* solo.

(12) HAL must have been given details of the crew's personal backgrounds. Bowman's and Poole's facial features (as witnessed in the "read my lips" scene, in the pod, through HAL's eerie eye) are nearly identical. C.f. the "twins" theory, comparing HAL's double on earth.

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Appendix 1

Computer Translations of HAL's Dialogue with Poole

Translation：

Game Etiquette	Game Descriptors	
Poole：とにかくUmm は…、	女王担保を取る。	(14a)
HAL：	司教は騎士の担保を取る。	(14b)
Poole：美しい移動。えー…	王者へのミヤマガラス。	(15a)
HAL：私は残念の無料配達郵便物である。私はそれを逃したことを考える。		
	司教３への女王。	(15b)
	司教は女王を取る。	(16a)
	騎士は司教を取る。	(16b)
Poole：アンペア時… ええ、あなたのように見えは右である。	仲間。	
HAL：楽しいゲームをありがとう	私は辞職する。	
Poole：ええ。ありがとう。		
(90字)	(67字)	

Back-Translation：

Game Etiquette	Game Descriptors	
Poole：In any case Umm...	Queen takes mortgage.	(14a)
HAL：	The Bishop takes the mortgage of the horseman.	(14b)
Poole：Beautiful movement. Obtaining-...	ミヤマガラス to ace.	(15a)
HAL：I am the free delivery mails of regrettable. I think of that it lets escape that.		
	The Queen to of Bishop Three.	(15b)
	The Bishop takes the Queen.	(16a)
	The horseman takes the Bishop.	(16b)
	Companion.	
Poole：At the time of the ampere... it can obtain, like you being visible is the right.	I resign.	
HAL：Thank you for an enjoyable game.		
Poole：Yeah. Thank you.		
(48 words)	(33 words)	

Appendix 2

Computer Translations of HAL's Swan Song

Original：

Daisy, Daisy, give me your answer, do, I'm half crazy all for the love of you,
It won't be a stylish marriage, I can't afford a carriage,
But you'll look sweet on the seat of a bicycle built for two.

Japanese：

ヒナギク、ヒナギクは、私にあなたの答えを、
私すべてである半分狂気あなたのそれの愛のためのでない流行の結婚与える、
私はキャリッジをできることができないが2を造られた自転車の座席で甘く見る。

Back-Translation：

But in me your answering, for the half insane your that love which is my everything marriage of the popularity which is not it gives ヒナギク and poult ギク,
I it is not possible to be able to do the carriage,
see sweetly with the seat of the bicycle which was made 2.

Chinese：

雛菊, 雛菊, 給我您的答復, 我是半瘋狂的所有為愛您, 它不會是時髦婚姻, 我無法買得起支架,
但是您將看起來甜在自行車的位子被製造為二。

Back-Translation：

The English daisy, the English daisy, for me your answer,
I is half crazy possessing for loves you,
it cannot be the fashionable marriage, I am unable to buy the support,
but you will look like sweetly in the bicycle seat by the manufacture will be two.

(ジャン・スチュワート：英語メディア学科　教授)