Shakespeare's invention of theatre as simulation that runs on minds

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Abstract

In any fully functioning cognitive system, such as the human mind, emotions would be central since, as Simon (1967) pointed out, either they, or something like them, are needed to manage cognition and action. The management is in relation to an outer world of objects and events for which mental models will always be incomplete and sometimes incorrect, and for which agency will often be inadequate. In the human case it is also in relation to an inner world in which we humans have many goals (concerns), some of which are in conflict with each other, and in relation to a social world in which we cooperate and conflict with other agents constituted somewhat as we are.

I propose that the central issue of designing a complete cognitive system relates to this last issue: distributed cognition and agency. We humans bridge our cognitive deficit of inadequate knowledge and agency, by cooperating with others to extend our mental models and capabilities. We are members of that species who accomplish together what we cannot do alone. This is the solution to which the evolution of the human brain has devoted most of its computing resources.

A principal means of improving our understanding of such matters is indeed simulation, but—perhaps paradoxically in the context of AISB—the kind of simulation that runs on minds rather than on computers. In modern Western culture, it was Shakespeare who first implemented this idea. Shakespeare's great innovation was of theatre as a model of the world. The audience member constructs the simulated model in the course of the play, and thereby takes part in the design activity. So fiction is to understanding social interaction as computer simulation is to understanding, perception and reasoning. Shakespeare designed plays as simulations of human actions in relation to predicaments, so that the deep structure of selfhood and of the interaction of people who have distinct personalities becomes clearer. I explore this idea by analyses of *Henry IV Part 1, As You Like It,* and *Hamlet.* As we run such simulations on our minds, we not only construct and experience the emotions of the vicissitudes that cause them, but we are enabled to reflect on them to create deeper mental models of individuals (including ourselves) and of interaction. Understanding the properties of such mental models is the principal step in designing a fully human-like mind.

Simulation and the role of emotions in distributed cognition

If we should want to simulate a working cognitive system in something like the quotidian world that we human beings inhabit, emotions would be central. Emotions can be thought of in as processes that manage cognition and action in the individual mind. The management is, as Simon (1967) pointed out, in relation to an outer world of things and events for which our mental models are always incomplete and often incorrect, and for which our agency is frequently inadequate. It is in relation to an inner world in which we have many goals and concerns some of which are incompatible with each other. It is also (as Simon did not point out) in relation to a social world in which we cooperate and conflict with other agents who are constituted somewhat as we are (Oatley, 1992).

Emotions in the individual are types of readiness for certain repertoires of action, and they are experienced as urges towards these actions. Aubé and Sentenyi (1996) have called them commitment operators. Not only do they make the cognitive system ready to act in a certain way, they commit us to act in this way. When angry, for instance, an individual becomes committed to redress and finds is hard to think of anything else.

More important than individual psychology is the consideration of how emotions work in social interaction. Emotions are commitments in the social world—the world of distributed cognition and action. Anger properly then is the emotion of social conflict, of one person getting his or her way in relation to another person who does not.

Evolution, emotions, sociality

I propose that the central issue of designing a complete cognitive system relates to distributed cognition and agency. Outline scripts (role-relationships) for social interaction are based on emotions. Jenkins & Greenbaum (1999), and Oatley and Jenkins (in press) have proposed three primary kinds of socio-emotional scripts, each with its prototypical emotion and its higher level goal.

The first is attachment of the kind described by Bowlby (1971). It emerged in evolutionary time some 70 million year ago, and it is characteristic of mammalian life. It probably forms the foundations of cooperative sociality. Its

prototypical emotion is anxiety and its overall goal is protection (Goldberg, Grusec, & Jenkins, 1999) in the first place of infants from predation and intra-species aggression. Later in life it provides bases for trust and protective attitudes towards others more generally, or alternatively for its opposite: distrust and Machiavellianism.

The second is assertion. In evolutionary time this may have emerged earlier than attachment, in relation to dominance hierarchies which are widespread in mammalian and avian social species. Its characteristic emotion is anger. In evolution its overall goal has been to challenge for, or to respond to a challenge, for position (status) in a dominance hierarchy. This is the system for within-group conflict and competition. In humans the concern with status is typically felt in terms of self-esteem. Anger sets up a frame, a script, or as Averill (1982) says a temporary role, for a status dispute. It occurs typically in a relationship with someone close (a son, a daughter, a spouse, a colleague) when something such as a slight or a failure to do what was promised undermines mutual expectations in the relationship. If one is angry, the emotion commits one to seeing the issue through socially, renegotiating status—who was to blame, who should apologize, who should undertake some amendment of life—and typically also coming to some reconciliation, which usually involves readjusting the relationship in order to continue on somewhat different terms.

The third is affection. This system is distributed much more unevenly among mammals. It is widespread only in primates, and it becomes distinctive only in humans. Its emotion is affectionate happiness, and its overall goal is cooperation. In humans this system became especially important with long-term sexual relationships in which the male made an economic contribution to the rearing of specific offspring, beginning some 3 to 5 million years ago (Lovejoy, 1981).

We are members of that species who cooperate to accomplish what we cannot do alone. The system of cooperation is the means by which we humans bridge the cognitive deficit of our inadequate knowledge and agency. By cooperation with others we extend our mental models and capabilities. Moreover we can sometimes deal with multiple goals by having different people represent different concerns.

Conversation and the origins of language

We infer from the work of Dunbar (1996) that cooperation, in a background of competition, is the solution to which the human brain has devoted most of its computing power. Primates have relatively larger brains than other mammals. The human brain is some 1300 cc in volume; that of a typical non-primate mammal of our body weight is 180 cc. The increase in size largely accounted for by the neocortex, which reaches 80% of brain volume in humans. The larger cortical size in primates is correlated with fruit eating and foraging over large territories. Most of all, however, it is associated with living in highly interactive social groups.

Aiello and Dunbar (1993) have shown that the ratio of neocortical size to the rest of the brain in primates correlates closely with the mean size of the social group of that species. The two species with the largest brains are chimpanzees and ourselves. Here is Dunbar's core hypothesis. The increase in size of primate brains, as one moves from species to species, is based on the number of others for whom one not only has individual mental models, but models of pair-wise relationships in the group. Chimpanzee social networks can include some 60 individuals, known in what we might call this personal way. Human social networks have about 140 or so, perhaps upto 200.

Dunbar has also proposed that cooperation in primate groups is maintained by mutual grooming: the basis of affectionate friendships and alliances. Many species of monkeys and apes spend up to 20% of their time in grooming. But as group size increases, so does the number of affectionate relationships one needs to maintain, and hence the amount of grooming one needs to do. With a mean group size that is more than twice that of chimpanzees, humans would need to spend more than 40% of their time grooming. Add another 33% for sleep, and one can see that time left for the business of acquiring food and other necessaries of life shrinks to an implausibly low amount.

Dunbar's solution is that that, in humans, conversation has taken over the function of grooming. On the basis of estimated group size and the amount of grooming required to maintain one's affectionate relationships, Aiello and Dunbar calculate that human language emerged about 250,000 years ago. Conversation enables us to not only to do something else while we verbally groom, but also to groom with more than one person at a time. (Manual primate grooming is with only one other individual at a time, and it excludes other activities.) Perhaps most importantly—though Dunbar does not discuss this—perhaps in the explicit commitments that are made to other people, to joint plans, to shared beliefs, conversation is probably more efficient in forming and maintaining relationships than manual grooming. In studies of what people talk about, in conversations Dunbar (1996) has found

that, indeed, some 70% of it is about the social lives of ourselves and our acquaintances. These people are friends and enemies, the trusted and the untrustworthy. What is known as gossip, the informal recitation and analysis of action and character, is about forming mental models of others, and of pairwise relations between others, with whom we have interacted in the past, and with whom we may interact in the future

Here, then, is my hypothesis, following Dunbar. Suppose that in evolution the hypertrophy of the human cortex was due to developing mental models of a large number of others, and that conversational language evolved to maintain cooperative relationships. If, moreover, as argued above, the real stuff of life is emotional rather than perceptual interpretation and intellectual problem solving, then if we wish to model a fully human-like cognitive system, we should follow the lead of primate evolution. We should devote the larger part of computational resources to social issues.

One could argue that even if Dunbar is right, and that hypertrophied human brain is based on sociality and conversation, that once modules for "mental-model-of-the-individual" and "mental-model-of-the-dyadic-relationship" and perhaps some higher order group models were properly designed, they would merely need to be iterated to deal with all the people we know. No new principles need be evolved.

This may be partially correct, but it is not likely to be fully correct for three reasons. First is the large difference in brain size as a function of body weight between non-primate mammals and primates, for instance between members of the cat and dog families and monkeys. Cats and dogs are clearly social, but in ways but that do not include mental models of distinct individuals, as monkeys and apes do. Second is the fact that language is a complex function to which substantial neural computing power is devoted. Third is that, both in everyday human conversation and in the problems that continue to preoccupy us, it is the social world that fascinates. It remains intensely important to us: whom should we chose as a sexual partner, how can we continue when someone of immense importance to us has died, how can we respond to a child who seems uninterested by school and chooses the most unsuitable friends, how should we treat a colleague who is so cantankerous as to make dealing with him/her impossible?

Artificial Emotion (AE)

Among the considerations we need to design a fully functioning mind are, if I may use a notion coined by E.O. Wilson (1998) not just artificial intelligence (AI) but its counterpart artificial emotion (AE). The emotional themes I discussed above—attachment-based anxiety, assertion-based anger, and affection-based happiness—become the bases for principal themes. It is the possibilities of enactment of these themes among individuals who have different characters—bold, boastful, manipulative, affectionate, envious, obsessive—that has posed during evolution, and continues to pose in our everyday lives, the great challenge to our brain-power and our mental models. It is this that leads to the indefinitely large number of scenarios and plot lines that we try to understand.

We should, moreover, remember, as Neisser (1963) pointed out, that in humans adult mental life is based on accretion within evolutionary and developmental sequences. The propensity to trust or distrust, for instance, is thought to be based on species-specific attachment schemas, and on early experience in at least one attachment relationship. Assertion-based aggression is based on temperament and the particularities of success and failure in status disputes. Amiability and cooperativeness are though to be based on temperamental warmth and on a person's history of affectionate relationships.

My proposal is that within human culture, and within the developing minds of individuals, a principal means of improving our understanding of such matters is by means of simulations. But, perhaps paradoxically in the context of an AISB conference, these simulations run on minds rather than on computers. I propose that in modern Western culture, Shakespeare was the first to grasp this idea fully.

The simulations of fiction

Fiction no doubt arose from conversation—from the "She did such and such, and then do you know what happened?" This is the basis. It grew to group story-telling, and oral recitations.

The devices of oral recitation in small groups were augmented by two developments that extended to larger groups: religious rituals and the invention of writing. In the two Middle-Eastern/Western cultures that have preserved a continuity of written language for 3000 years—Hebrew and Greek—we see how these streams have developed in somewhat different ways. In Judaism, the written word became the central element in worship. The togetherness of worship involved (and still involves) both rituals and cultural commitment to ideas and ideals. In Greece, the oral tradition of storytelling, rendered into written form by Homer, also had a quality of ritual meetings in substantial numbers. It came to be implemented in the theatre, where the narrator was replaced by an actor in counterpoint with a

chorus. The theatre grew to exceed the temple, in size and perhaps in importance.

Shakespeare's great innovation, soon after the even more expansivist invention of printing, was his idea of theatre as a model of the world. The audience member constructs a simulated model in the course of the play, and thereby becomes part of the design process. One sees Shakespeare's idea, and its aspiration to human universality, not just in his calling his theatre "The Globe." One sees it not just in speeches like "All the world's a stage," in which a metaphor (the literary term for simulation) transforms our vision of an aspect of reality. One sees it in the deep structure of his plays. So theatre and fiction are to understanding social interaction as computer simulation is to understanding perception and problem-solving.

Shakespeare's plays are simulations of the interactions of people with their predicaments so that the deep structure of selfhood and social interaction becomes clearer. Shakespeare's idea was to take seriously what Aristotle called *mimesis.* I have argued (Oatley, 1992, 1999) that *mimesis* is best translated as simulation. The simulations that are plays and novels run on minds rather than computers. Many of the considerations of computational simulations apply also to literary ones. For instance, in computation there are two kinds of code. Some code represents aspects of the real world that is being simulated. Other parts are instructions to the computer about how to conduct the simulation. Similarly in any story or play, one aspect which we may call the story structure (that Russian literary theorists called the *fabula*) is representation of the story world. The second aspect, the discourse structure (*siuzhet*) has attributes of speech acts, instructions to the reader or audience as to how to construct and run the simulation. As we run such simulations on our minds, we not only experience the emotions and hence the urgency of the human vicissitudes and dilemmas that cause them, but we are enabled to reflect on them in such a way as to create deeper level mental models of ourselves and others.

As with any simulation, literary simulation selects some aspects as important, and these are emphasized by being the ones that are set into interaction with each other, to produce the outcomes. What, then, are the main aspects of Shakespeare's simulations? I argue that there are three.

Three aspects of Shakepearian simulation

The first is the basic structure of all narrative: goal-directed actions by human agents who meet vicissitudes. Here begins the emergence of mind, in our compulsion to see action as purposeful. Narrative is the computational language for expressing such purposes, and within it the structure of causation in both the interpersonal and physical world. "She was so angry that she took all his stuff out into the garden and made a bonfire of it." The reader/listener infers, and mentally constructs, the causal sequence: purpose—>action—>outcome-with-the-aid-of-the-physics-of-combustion.

The second is often argued to be Shakespeare's invention: his depiction of what in literary theory is called character, and in psychology is called personality; see, for instance, Bloom (1999). Here is the idea in cognitive terms. People's actions and thoughts flow from interpersonal goals that are habitual, and hence somewhat predictable by self and others. We define character, and its effects, in terms of such habitual goals. As Henry James (1884) put it: "What is character but the determination of incident? What is incident but the illustration of character?"

The third has been widely recognized but not so explicitly discussed. It is the aspect of emotions. We all know that fiction includes the idea that emotion occurs when a human goal meets with a vicissitude. I propose, in addition, that further sense can be made by means of the three primary interpersonal motivational systems—attachment, assertion, affection—which are inherently emotional. Character then becomes, in part at least, a predominance of one of these emotion-based systems that has, in the better kind of fiction, another in conflict with it. So, for instance, Hotspur in the Shakespeare play that I discuss first, is impulsively aggressive. He is the Renaissance warrior full of derring do. But he is also an affectionate husband. The effects of incident upon the individual (character, audience member, reader) then, become the somewhat habitual emotional responses of the individual to vicissitudes (incidents) in interpersonal contexts.

Three plays

Let me now discuss three of Shakespeare's plays in the order in which they were written, between 1598 and 1600, *Henry IV Part 1, As You Like It,* and *Hamlet,* to show his development of his idea of mimesis-simulation, and some of his implementations using these three aspects.

Henry IV Part 1

The first of these plays, *Henry IV Part 1*, (Shakespeare, 1623c) is about politics. Politics is about assertion, about getting one's own way, but it is also about the other two socio-emotional modes: attachment-based trust and distrust, and affection-based cooperation.

Surface and deep structure. Those of us who have had occasion to observe or to take part in politics, either at the national level or in smaller contexts such as the university, will recognize the following paradox. Politics is that domain in which, because we have limited mental models but nevertheless need to act, is typically guided by cooperative group discussion (Aristotelian dialectic), with one person or faction arguing for doing this and another for doing that. It occurs in the context of status-based hierarchies. On the surface, in political discussion, people give reasons in the rhetorical form of rationality. But one may think, on listening to them, that their arguments are tendentious: motivated by desires that are kept beneath the surface. There is an equivalent surface level in oneself: "I am right and they are wrong." In such discussions one may then hear oneself being authorititative, shrill, or hectoring. The paradox is that as one begins to take part in the discussion, the same doubt as to tendentiousness, as to good versus bad faith, is immediately cast by others upon oneself. They may then cease to listen to anything one has to say. Political discussions, thereby easily become not so much explorations about how best to act, but competitions based on the assertive social modes of power, solidarity, and fear.

So, how should the essayist, playwright, or novelist portray the deep structure of politics? To denounce is to adopt the same genre of discourse, to take up a role indistinguishable from politicians on whom one wishes to comment. The answer comes, I suggest via Erasmus, the central literary figure in the northern Renaissance, who wrote about 500 years ago.

The influence of Erasmus. Without Erasmus there would have been no Shakespeare. Erasmus was the first writer to benefit largely from the invention of printing. It was he who set the curriculum for school-based education as reading and writing: hence the grammar school in Stratford that Shakespeare is thought to have attended, in which he would have practiced the classical-medieval mode of putting an argument, and then with equal force its antithesis (see, for instance, how he handles the debate about slaying Caesar, in *Julius Caesar*).

Erasmus's books were widely read. We know, from his use of them, that Shakespeare read Erasmus's collections of *Adages* (Latin translations of Greek sayings and quotations). An example is: *"mare malorum,"* "sea of troubles," which occurs in the most famous speech in all of Shakespeare: "To be or not to be ... to take arms against a sea of troubles ..." (*Hamlet,* 3, 1, 56-59).

It must be certain that Erasmus's most popular book, *Praise of Folly,* (1508) would have been read by the intensely bookish Shakespeare. In *Praise of Folly,* Erasmus introduces a metaphorical figure Folly—a woman in that age of male public action—and has her give a speech in praise of herself: a foolish thing to do. In this book Erasmus proposed that what is on the surface is not typically what is important. His way of doing this was to personify the disowned (seemingly foolish) emotional aspect of public life, together with instructions (*siuzjet*—discourse structure) to the reader to run the simulation in the mode of irony. The effect is to prompt one toward forming a representation that includes both emotions and reasons, with the irony prompting reflection not only on the deep structure of many kinds of public discourse, their pomps and their circumstance, but on one's own involvement in such structures. By taking part in such simulations, one might even come to prefer the candidness of emotion over the more dignified discourses of so-called reason.

My suggestion is that it was *Praise of Folly* that prompted Shakespeare's crystallization of his idea about how to portray the deep structure of politics as a stage-based simulation of several characters in interaction. *Henry IV Part* was his first implementation.

High life simulated by the low. In the opening speech of the play King Henry proclaims that now civil strife in his kingdom has ended, he and his men at arms can go, no longer divided but united, to undertake a Crusade, to make war on foreigners. The speech is stirring and patriotic: or (not an exclusive "or") under the ironic lens that Shakespeare has inherited from Erasmus, it is an utterance that betrays the King's compulsive purpose of aggression.

Then comes news of more civil conflict, and the (regretful?) postponement of the foreign adventure to put down an incursion in Wales. Quickly thereafter comes news of the young Hotspur who has routed a Scottish force and taken many prisoners, valuable for purposes of ransom, a source of aristocratic booty. Like the King, Hotspur represents assertion-aggression, and the King voices his regret that his own son and heir, Prince Hal, is not more like him. The King also represents distrust (attachment based) and the calculating manipulativeness to which it gives rise—a character trait that will emerge also in his son who later becomes Henry V, in the play of that name.

By means of alternating scenes, Shakespeare juxtaposes (simulates) the aristocratic group by means of another group: that of the dissipated Jack Falstaff and his layabout tavern friends who include Prince Hal. In a deeper and more

psychological simulation, Shakespeare presents Falstaff as surrogate father to the Prince.

In the second scene, Falstaff and his gang also hatch a plan of force of arms: a highway robbery of some pilgrims. Poins and Prince Hal subsequently conspire to arrive late for their arranged part in the robbery, and then to rob Falstaff and his three companions of the booty, so as to witness Fastaff's cowardice and subsequently to hear his lies as he recounts the episode. Here are the seeds of the young Prince's manipulativeness.

Jacobson (1988) has proposed two basic modes of language: juxtaposition, the metonymic, and seeing a as b, the metaphorical. Shakespeare is the master of both. Here he uses the one to accomplish the other. This play is the first in theatrical history to juxtapose depictions of high and low life on the stage. By this means Shakespeare achieves metaphor in the large: aristocratic politics as gang-based brigandry.

These devices, which extend throughout the play, also include the opportunity for Erasmusian irony: Falstaff, after he too has taken a cowardly part in the Battle of Shrewsbury—the Falstaff whom many audience members have come by this juncture to like—speaks ironically of the machinery of political force, honour:

> Can honour set a leg? No. Or an arm? No. Or take away the grief of a wound? No. Honour hath no skill in surgery, then? No. What is honour? A word. What is in the word honour? What is that honour? Air. A trim reckoning. Who hath it? He that died o' Wednesday (5, 1, 131-136).

The device of simulating the ennobled by means of the dissipated also enables the transformation of Prince Hal from the role of tavern layabout to his proper role as His Majesty, in a way that retains his character intact. At the end of Act 1, scene 2, he offers a soliloquy about his intended metamorphosis that is both self justifying and coldly calculating. By the end of this play he becomes the princely Prince who fights and kills Hotspur in the Battle of Shrewsbury. Two plays later he is the kingly King Henry V.

Elizabethan politics. It is said that it is hard to gauge Shakespeare's political sympathies. He is thought to have been born into a Catholic family (though evidence is ambiguous because it needed to be kept quiet for the political reasons of the very kind that we are discussing). He is known to have moved to London which was largely Protestant at that time, not long after the Catholic-Protestant antagonisms that still bedevil us had been born—a time also when that other figure who influenced him much, Christopher Marlowe, was killed for political reasons.

I believe we understand Shakespeare's political stance better if we see him as intensely fascinated by, but also horrified by, public violence. He strove to depict not whom to take sides with, which is the easy but violence-reproducing option for us all. He strove to depict the very stuff of politics. He represented a world in which Henry V became the great English national hero who triumphed at Agincourt against those traditional enemies, the French, who was at the same time the ruthless and manipulative leader who used self-serving rhetoric to mobilize his troops, and a foreign war to stifle criticism at home. (Thus has British politics continued into recent times.) Such portraits cannot be sustained by the either-or of political discourse. They need simulations of people whose different, and conflicting, parts of character are brought into action as individual centres of consciousness that purposefully affect external events, and bring about the vicissitudes of their own plans. Such a simulation is not an invitation to believe this or do that. The audience or reader must make the final integration by running the simulation on her or his own mind.

As You Like It

In *As You Like It*, (1623a) the play in which the lugubrious Jacques offers his speech "All the world's a stage, | And all the men and women merely players," Shakespeare tips us off as to his method and intent.

Simulation within the play. The idea is clear enough. It is reiterated elsewhere, for instance in the sorcerer Prospero's speech in *The Tempest*, (1623d) which is often seen as the farewell to the London stage by Shakespeare, the ultimate dramatic sorcerer. Here, he not only explains his method, but encloses it in a miniature mimesis-simulation-metaphor of his most universal commonplace, the passing of human life after its brief drama:

> These our actors,
> As I foretold you, were all spirits and
> Are melted into air, into thin air.
> ... the great globe itself,
> Yea, all which it inherit, shall dissolve,
> And like this insubstantial pageant,
> Leave not a wrack [wreck] behind. We are such stuff
> As dreams are made on, and our little life
> Is rounded with a sleep (4, 1, 148-158).

But it is not just this kind of magical invocation that is at issue. The point, as in the *Henry IV* and *Henry V* plays, is the deep structure. In *As You Like It*, the structure at issue is that of cooperative affection and courtship. In this mode, once again the surface is misleading.

Let me put the problem and its paradoxical qualities in prose. Even in the mode of most affectionate cooperation, all is not straightforward because of the enormity of the life-time commitment that is implied by falling in love. To fall in love, the first stage is to be open to the experience and to see someone whom one likes, perhaps accidentally. Then, after an interval when one reflects and builds fantasies about the person, one needs to see the person again. At this time, by means of a word or sign, one hopes for a piece of evidence that one's interest is reciprocated. If it is, then one is in love: there! Yet more importantly, one is reassured that the love is mutual. The difficulty is that, despite the suddenness of such changes intermediate steps must be gradual, and often ambiguous. Such steps need both to be interpretable as signs of intense interest but also, if not reciprocated—such is the delicacy of selfhood—as something quite different. Here is the paradox: the very moment when one must be most ambiguous, hence potentially deceptive, is that in which one must be most open. It would be the worst possible start of this all-important relationship to be dupicitous.

Shakespeare handles this as follows, by means not just of a simulation, which is the play itself, but by emphasizing that what the audience is watching is a simulation. This he does by embedding, within the play, yet another simulation. In *As You Like It,* first he has Rosalind pass, without much ceremony, through the first stage of falling in love with Orlando, and he with her, after Orlando attracts notice by winning a wrestling match. Next, Shakespeare moves the action from the normal world (a ducal court) to an imaginary (simulated) idyllic world of nature, the Forest of Arden. Here, Rosalind dresses up as (simulates) a young man, Ganymede. By this device, when Rosalind (Ganymede) meets with Orlando, he can speak to Ganymede of his love for Rosalind. She is ironic about the state of being in love in general. She promises to cure him of it by acting as young men believe women do act in this state, "proud, fantastical, apish, shallow, inconstant ..." and so forth through many confusing and conflicting moods. To accomplish this she suggests that Orlando should speak to Ganymede as he would to Rosalind: "call me Rosalind, and come every day to my cot [cottage], and woo me." Orlando says he does not want to be cured but, fascinated by the challenge, he does agree. After another interval, he presents himself. He arrives late, so Rosalind reproves him. For lovers, she explains, being even a fraction of a minute late is subject to the severest of interpretations. She says she would "as lief be wooed of a snail."

> *Orlando* Of a snail?
>
> *Rosalind* Ay, of a snail; for though he comes slowly, he carries his house on his head—a better jointure [joint property], I think, than you make a woman. Besides he brings his destiny with him.
>
> *Orlando* What's that?
>
> *Rosalind* Why, horns, which such as you are fain to be beholden to your wives for. But he comes armed in his fortune, and prevents the slander of his wife.

Most of us would be content with the small but conventional joke about a snail's slowness. But one may gain a glimpse of Shakespeare's genius by how he handles it, in his mode of metaphor-simulation. His joke about jointure indicates that Rosalind knows Orlando is a second son. It is also one of which sociobiologists nearly 400 years later would have been proud. Shakespeare goes yet further, elaborating the theme of what men generally think about women using the idea of horns—the badge of cuckoldry—and elaborating too the overall theme of candour in affectionate relationships.

A few lines later Rosalind/Ganymede has pardoned Orlando, and there follows this:

> *Rosalind* Now woo me, woo me, for I am in a holiday humour, and like enough to consent. What would you say to me now an I were your very, very Rosalind?
>
> *Orlando* I would kiss before I spoke.
>
> *Rosalind* Nay, you were better speak first, and when you were gravelled [stuck] for lack of matter you might take occasion to kiss (4, 1, 62-69).

And so forth. It is a delicate scene, full of further erotic wit on Rosalind's part, in which the audience knows, and knows that Rosalind knows, and suspects also that Orlando must suspect, that he is indeed talking to Rosalind, and she to him. All is within a structure of simulation where the indirection allows them both to be direct, as they could never be in the ordinary world beyond the Forest of Arden. From this, might we see our way to being more direct in our dealings with those we love?

Hamlet

Hamlet, (1623b) is a play about grief, the emotional mode that occurs when someone dies, who is an attachment figure held in affection. The question, "To be or not to be," is whether to enter the mode of assertive revenge or to take to suicide.

The play within the play of *Hamlet* is a mimesis-simulation performed by a troupe of travelling

actors. Hamlet hatches his purpose to present this simulation of the purposeful killing by Claudius of his father in order to usurp his own succession to the throne and to wed his mother. So he inserts a dozen or sixteen lines into a play which the travelling actors have in their repertoire: "The play's the thing | Wherein I'll catch the conscience of the King [Claudius]." Thereby he plans for his suspicions from the unreliable source of his father's ghost to be confirmed or refuted, and for Claudius's emotional reaction to the simulation to become a public demonstration. Thus is drawn a nice thread between the medieval notion of acting vengefully on mere private suspicion, and the modern notion that one needs publicly accountable evidence to accomplish justice.

In *Hamlet*, however, Shakespeare's mimesis-simulation idea goes yet deeper. For here he returns again to the issue of public violence, with which he dealt in *Henry IV*. But now the scope is widened from Kings and thieves, to everyman, to ourselves when whatever is emotionally closest to us—outrage at the murder of our dearest, our rights being usurped, disgust at our mother's sexuality—takes possession of our deepest and most urgent concerns. In this simulation, each member of the audience becomes Hamlet, becomes depressed, is driven half mad ("but mad north-north-west"), becomes violently aggressive, becomes contemptuous not just of one beloved but of all.

As such we experience the forces driving towards conventional outcomes: suicidal violence against self or vengeful violence against another. Now, in slowed-down paces, Shakespeare steps us through the experience of Hamlet's states (simulated: ours but not ours) so that we the audience experience its emotions and its confusion as the complacent world of family unravels. We become suspicious at being watched, angry at the mother, despairing at being unable to act in tune with our carefully constructed sense of self. None of the ordinary modes in which we are practiced, trust or distrust, assertiveness, affection, is of any avail. We reflect upon the vulnerability of our human existence, even when supplied with the very best of minds as Shakespeare's is, and Hamlet's is.

Conclusion

The issues of social interaction that Shakespeare treats in his simulations are, I believe, those to which the great weight of neo-cortical computing power has been devoted in the species *Homo sapiens* and those to which, if we wished to design a fully functioning cognitive system, we too might properly attend. These issues are of understanding humans such as ourselves, and humans who are different from ourselves, issues of emotions, issues of what goes on between and among people. These are the issues that the human mind is most adapted to compute over.

This adaptation has generated extraordinary abilities to understand, and take part in, both cooperation and conflict, which have been the bases of our success as a species. At the same time, in many of their aspects, the implications of these issues are too difficult for the unaided human mind to comprehend—hence the evolution of the pre-simulations of conversations in distributed cognition, and of the more elaborate simulations of plays and novels, in which the issues can be explored more deeply. Hence, the almost unbelievable fact that by means of a few thousand pieces of language code (words) a whole world, with people in it, can be programmed and summoned up.

By such means we can derive insights: new pieces of code and representation that we can program into ourselves to make sense of human social-interactive complexities. Insights can occur when we both experience emotions relevant to events and simultaneously can interpret these same events. But despite such insights, full understanding seems often to lie just beyond the horizon of human mental modeling.

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