The Genius of Autism

A new view of the mind and mental illness

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Contents

Preface

The origins of this book go back to the late 1990s when Charles Crawford asked me to contribute a chapter to a book on the applications of evolutionary psychology[1] which was pre-published on the Great Debate website in 2002[2]. There I first developed the concepts of mentalistic and mechanistic cognition, but the few thousand words available to me were self-evidently too few to enable me to do more than sketch out the idea and its far-reaching implications, and so I immediately began work on something longer, which eventually became this book.

At the same time, it occurred to me that the striking antithesis that I had noted between the symptoms of autism and paranoid schizophrenia was reminiscent of that seen between those of Prader-Willi and Angelman syndromes: two developmental disorders not long before discovered to be due to oppositely transposed disorders in imprinting at the same site on chromosome 15. In 2002 I got into correspondence with Prof Bernard Crespi at Simon Fraser University in Vancouver, and repeated my suggestion. To my great pleasure and surprise, Prof Crespi—a leading geneticist, and not a complete amateur like myself—took up the idea and together we published two papers outlining the theory in scientific journals[3][4] to be followed by a third by Crespi alone:[5]. In doing so, Prof Crespi convinced me that the pattern I had first noticed probably applied to most psychotic illnesses, and not just to paranoia, as I had originally supposed, and chapter 5 of this book summarizes this view (illustrated by diagram 5.1, originally devised by Prof Crespi and reproduced here with his kind permission). However, in writing that particular chapter I had cause to go back to a manuscript of mine originally entitled, *The Maternal Brain and the Battle of the Sexes in the Mind,* and the present chapter 5 also draws on the ideas of that earlier, unpublished work. But clearly, any progress I

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[1] Badcock, C.R., *Mentalism and Mechanism: the twin modes of human cognition*, in *Evolutionary Psychology, Public Policy and Personal Decisions*, C. Crawford and C. Salmon, Editors. 2004, Lawrence Erlbaum Associates: Mahwah, NJ. p. 99-116.

[2] Badcock, C.R. *Mentalism and Mechanism: the twin modes of human cognition.* [HTML document/PDF] 2002; Pre-publication of Chapter 5 in *Human Nature and Social Values: Implications of Evolutionary Psychology for Public Policy* edited by Charles Crawford & Catherine Salmon (Erlbaum, 2004), pp.99-116.:[Available from: http://www.thegreatdebate.org.uk/MentalismCB.html.

[3] Badcock, C.R. and B. Crespi, *Imbalanced genomic imprinting in brain development: an evolutionary basis for the etiology of autism.* Journal of Evolutionary Biology, 2006. **19**(4): p. 1007-32.

[4] Crespi, B. and C. Badcock, *Psychosis and Autism as Diametrical Disorders of the Social Brain.* Behavioral and Brain Sciences, 2008. **31**(3): p. 241-320.

[5] Crespi, B.J., *Genomic imprinting in the development and evolution of psychotic spectrum conditions.* Biological Reviews, 2008. **83:**: p. 441-493.

may have made here is largely thanks to Prof Crespi. Suffice it to say that the present book could not have been written without his input and inspiration, and will owe any success it has as much to him as to its ostensible author.

My experience of teaching some of the material covered here to students following my courses at the London School of Economics in recent years has convinced me that autism is a subject that resonates with many people in an often quite surprising way. I was certainly astonished to find how many of my students either had friends and relatives who were diagnosed with autistic spectrum disorders or had had personal experience of autism in other ways (such as helping out at special schools and camps). Indeed, following the LSE's enlightened decision to recognize Asperger's syndrome as a disability, I was delighted by the number of Asperger's students who actually registered for my courses, and deeply impressed with the courage of those who openly admitted their so-called disability in class discussions. So I must thank all those students for their contributions, along with my sons, James and Louis, and my wife, Lenis. Additionally I must thank Abdallah Badahdah, Simon Baron-Cohen, Kingsley Browne, Vikas Chandra, Martin Conway, Charles Crawford, Tom Dickins, Diana Fleischman, Janet Foster, the late and much lamented Bill Hamilton, Anthony Holland, Ayla and Nick Humphrey, Satoshi Kanazawa, Nicola Knight, Alan Lloyd,

Alex and Marian Monto, Rebecca Sear, John Skoyles, Peter Sozou, Sarita Soni, Thomas Suddendorf, Andy Thompson, Richard Webb, and Andy Wells. However, responsibility for everything said here remains of course entirely my own.

Christopher Badcock

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1. Mentalism, Autism, and Aliens

Like many important developments in science, the disorder we now know as *autism* was discovered more or less simultaneously by two independent researchers. In 1943 Leo Kanner (1896-1981) published a book based on eleven children at Johns Hopkins University Hospital in Baltimore, and in 1944 Hans Asperger (1906-1980) independently described four similar cases in Vienna. Kanner called the condition *early infantile autism* and Asperger *autistic psychopathy.* The term *autism* was originally introduced by the famous Swiss psychiatrist, Eugen Bleuler (1857-1939) to describe the characteristic alienation from reality found in schizophrenia (itself another Bleuler coinage). He derived it from the Greek autos (autos) meaning "self". However, this term is often rendered as "dereism" or "dereistic thinking" in translations of Bleuler's writings, with the result that today *autism* is almost exclusively associated with the syndrome described by Kanner and Asperger[6]. Nevertheless, it is worth noting that from the very beginning autism and schizophrenia were linked—albeit purely terminologically—and with the benefit of hindsight you might wonder to what extent this reflected inklings about the possible connection between the two disorders which it will be a major theme of this book to explore.

Autism is a disorder which usually first becomes apparent in childhood, mainly as a result of failure to develop normally. As one account puts it, "You hear a great deal about children with autism, far less about adults. In fact, autism starts to be noticed in childhood, but it is not a disorder of childhood. Instead it is a disorder of development"[7]. A consensus panel of the American Academy of Neurology suggested recently that a child with any of the following symptoms should be evaluated for possible autism: no babbling by 12 months; no gesturing, pointing, or waving good-bye by 12 months; no single words by 16 months; no two words spoken together spontaneously by 24 months; and any loss of language or social skills at any time[8]. Nevertheless, children can develop normally up to a certain point, and then regress; while others can appear to have early delays in these respects which are later fully compensated and leave no lasting deficits[9]. Typical symptoms of autism are set out in text box

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[6] Asperger, H., *'Autistic psychopathy' in childhood*, in *Autism and Asperger syndrome*. 1991, Cambridge University Press: Cambridge. p. 37-92.

[7] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[8] Kirn, T.F., *Universal Autism Screening For Children by Age 2 Is 'Practical Goal,' Expert Says.* Psychiatric Times Newsletter, 2003.

[9] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

1.1 along with a number of other features often mentioned in connection with autism although not found in all cases.[1]

Text box 1.1: Typical symptoms of autism

- social deficits in non-verbal communication such as eye-contact, gesture, facial expression, and body language;
- self-absorption, egocentricity, and lack of awareness of and insensitivity to others, with difficulty in establishing relationships, friendships, or peer-relations;
- delay, or total lack of language competence, with communication deficits in speech, gesture, and conversation;
- routinized, repetitive, or stereotyped movements, with distress over change and insistence on routine, or a compulsion to carry out rituals;
- fragmented sensory perception with inability to generalize, and pre-occupation with parts rather than wholes;
- abnormal pre-occupation with or intensity of interest in one subject or activity, perhaps with isolated areas of expertise and/or exceptional rote memory alongside more general cognitive impairment.

Additional symptoms often found in autism

- unusual beauty, often looking younger than they are, with a characteristic "autistic look"; odd or unusual gait;
- insensitivity to pain, often combined with insensitivity to cold (and sometimes lack of fear of heights and an amazing ability to survive falls);
- synaesthesia (mixing of perceptual categories) with confusion between different senses; problems with depth-perception, "white-out" effects and other visual deficits, particularly in relation to moving objects, strange places, or novel situations;

[1] For a fictitious, but remarkable insight into the world of a child with an autistic disorder see Mark Haddon's novel, *The Curious Incident of the Dog in the Night-time*[(10)]. Haddon, M., *The Curious Incident of the Dog in the Night-time*. 2003, London: Jonathan Cape. 271.

[(10)] Haddon, M., *The Curious Incident of the Dog in the Night-time*. 2003, London: Jonathan Cape. 271.

- unusual sensitivity to smell, sound, or other sensory perceptions, sometimes with sensations of "sensory overload";
- allergic or phobic reactions to specific foods, smells, or sensory perceptions, with resulting fastidious food preferences and avoidances;
- bowel disorders;
- sleep disorders;
- epilepsy;
- intolerance of itchy and/or tight clothing;
- chronic anxiety, often with excessive startle and fear reactions;
- fear of crowds and strangers, and dislike of socializing;
- panic reactions at being touched or hugged by people;
- a liking for being wedged in small, enclosing spaces, or tightly squeezed into corners;
- a fascination for machines, mechanisms, and gadgets of all kinds.

An important aspect of diagnosis in autism is the extreme variability of the symptoms. For example, children diagnosed with autism within the same family can show some strikingly different symptoms[11], and authorities point out that "None of the criteria exactly describes every individual with autism. Autism presents in a myriad of ways; every individual with autism is different and unique, and has features that would lead a person superficially examining them to say that this person can't have autism"[12].

According to the Fourth, Text Revision Edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders*, the incidence of autism is five cases per 10,000 individuals, with reported rates ranging from two to 20 cases per 10,000[13]. But a study of 788 pairs of twins investigating autistic tendencies using the Social Responsiveness Scale suggested that the point at which a person is

[11] Moore, C., *George and Sam.* 2004, London: Viking. 252.

[12] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts.* 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[13] American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders.* Fourth, Text Revision ed. 2000, Washington, DC: American Psychiatric Association. 943.

considered autistic is somewhat arbitrary and that autistic deficits are continuously distributed in the population with an incidence of 1.4 per cent for boys and 0.3 per cent for girls[14]. Diagnosed autism, in other words, may just be an extreme point on a much wider spectrum that shades into normality, with milder forms of autism being much more common than previously supposed. According to a recent study of 56,946 children aged 9-10 carried out in South-East England, the prevalence of autism spectrum disorders varies between 25 and 116 per 10,000, depending on the exact diagnostic criteria used. This study concluded that the prevalence of autism and related disorders is substantially greater than previously recognised, and amounted to about one per cent of the child population. Whether the increase is due to better ascertainment, broadening diagnostic criteria, or increased incidence remained unclear, but the study added that a true rise in incidence cannot be ruled out[15].

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You cannot go far in reading what autistics say about autism before you come across aliens. You soon find them saying things like, "I felt like an alien, as though I had come to earth from somewhere else"[16]. Other autistics have called their disorder "wrong planet syndrome"[17], and protest that they "don't remember signing up for this planet"[18]. Another autistic author who entitled her book *Through the Eyes of Aliens* comments that "Many autistic people affectionately, humorously refer to themselves as aliens. They feel displaced on a vast planet, which has a code of life, and understanding they can't ever quite subscribe to." She calls them "mysterious Martians who don't know the culture of the planet they have been misplaced on"[19]. One of the best-know autistic authors, Temple Grandin, has described herself in the title of a well-known book as *An Anthropologist on Mars*[20], and the writer and political activist Simone Weil (1909-43) who has been posthumously diagnosed with an autistic disorder was called "my little Martian" by one of her professors[21]. Two other authors gave their account of their "lives in the universe of autism" the interrogative title, *Women From Another Planet?*[22].

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[14] Constantino, J.N. and R.D. Todd, *Autistic Traits in the General Population: A Twin Study.* Archives of General Psychiatry, 2003. **60**: p. 524-530.

[15] Baird, G., et al., *Prevalence of disorders of the autism spectrum in a population cohort of children in South Thames: the Special Needs and Autism Project (SNAP).* Lancet, 2006. **368**: p. 210-15.

[16] Hadcroft, W., *The Feeling's Unmutual: Growing Up with Asperger Syndrome (Undiagnosed).* 2005, London: Jessica Kingsley Publishers. 236.

[17] Vermeulen, P., *Autistic Thinking - This is the Title.* 2001, London and Philadelphia: Jessica Kingsley Publishers. 159.

[18] Miller, J.K., *Women from Another Planet?* 2003, Bloomington, IN: 1stBooks. 263.

[19] O'Neill, J.L., *Through the Eyes of Aliens: A Book About Autistic People.* 1999, London: Jessica Kingsley. 144.

[20] Sacks, O., *An Anthropologist on Mars: Seven Paradoxical Tales.* 1995, London: Picador. 318.

[21] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts.* 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[22] Miller, J.K., *Women from Another Planet?* 2003, Bloomington, IN: 1stBooks. 263.

Contact with aliens is a staple of science-fiction, but if it ever happened in reality, the first reaction of those in authority would almost certainly be an attempt to protect the public by quarantining the extra-terrestrials. Certainly, the parallel with alien contact seems to have been borne out in what you might regard as the first phase of the human race's encounter with autism, running from its discovery during World War 2 to the early 1980s. The symbolism of quarantine is apt here because at this time autism was seen largely as a childhood disorder featuring severe mental retardation. You never heard much about adult autistics, and the impression you got was that, for someone with autism, there was no such thing as adulthood. Many autistics lived out their lives in long-stay hospitals ("asylums" as they were called then), effectively in a state of institutionalized infantilism, sometimes under regimes of real cruelty (as we shall see in a moment). Although this may have been rationalized at the time as being for the good of the individuals concerned rather than to protect society as a whole, the fact remains that, like aliens from outer space, those diagnosed autistic during this period were likely to be incarcerated in institutions of various kinds, and certainly to have been regarded as seriously alienated in the psychiatric sense of the word.

One of the worst examples of this is found in the person of Bruno Bettelheim (19031990) who became associated with the claim that autism was an entirely mental illness caused notoriously by "refrigerator mothers". In fact that term was first used by Leo Kanner to describe the frequently high-achieving, emotionally cold parents that he had noticed often tended to have autistic children[23]. As Uta Frith points out, "This caricature of bad mothering overlaps with the caricature of the career woman, in particular of the 'intellectual' type. An abnormally detached child—a child who is unable to relate lovingly—is a fitting punishment for the woman who neglected to be a full-time devoted wife and mother"[24]! Nevertheless, Kanner never blamed mothers for their children's autism and in 1941 had even published *In Defense of Mothers: How to Bring up Children in Spite of the More Zealous Psychologists*[25].

Bettelheim, however, was a different matter. As Director of the University of Chicago's Sonia Shankman Orthogenic School, he successfully applied to the Ford Foundation in 1956 for a research grant for the then enormous sum of $342,500 to discover, besides other things, what the parents of autistic children had done "wrong" in raising them[26]. The result was a number of articles, films, and a widely- read and highly influential book, *The Empty Fortress*[27]. Bettelheim started with what

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[23] Kanner, L., *Problems of Nosology and Psychodynamics of Early Infantile Autism.* American Journal of Orthopsychiatry, 1949. **19**: p. 416-26.

[24] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[25] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[26] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[27] Bettelheim, B., *The Empty Fortress: infantile autism and the birth of the self*. 1967, New York: Free Press.

he alleged were a dozen autistic children (six of each sex), and from the beginning claimed spectacular successes in treating them. The drawings of a girl called Mary and a boy called Dick were said to illustrate their improvement, and along with the case of "Joey, A Mechanical Boy," were published in *Scientific American*[28]. According to Bettelheim, Joey was a child who had been robbed of his humanity by parents who completely ignored him, did not want to care for him, and punished him when he cried. The result was that Joey had become a robot who could only eat when he was connected to an imaginary power source, only defecate when holding vacuum tubes that powered his bowels, and only avoided saying the wrong things thanks to an internal "criticizer"[29]. In other words, if Joey had become something of an alien, it was not because he was from outer space but because his parents had made him into one.

Bettelheim had been incarcerated in the Dachau and Buchenwald concentration camps for ten and a half months in 1938-9 and believed that he saw a valid parallel between the prisoners known as "Moslems" in the camps, and autistic children. Moslem was the name for prisoners who had given up all hope, avoided all eye contact, often refused to eat, and became completely passive and zombie-like. If autistic children resembled them in their behaviour, it could only be because their homes were the equivalent of concentration camps, and their parents—mothers especially—that of the cruel, persecuting guards. As early as 1950 Bettelheim had claimed that "it is common knowledge that the difficulties of almost all emotionally disturbed children have originated in the relation to the parent"[30]. In *The Empty Fortress* Bettelheim stated his belief that "the precipitating factor in infantile autism is the parent's wish that the child should not exist"[31].

Bettelheim thought that he had found further evidence of this in the case of so-called "Wolf Children" found near the Indian city of Orissa. Two girls had been discovered in a wolf's lair along with cubs in 1920. The girls were christened Amala and Kamala, and were believed to be aged about three and five respectively. Both ate only raw meat, growled if approached, and walked on all fours. Amala died within a year, but Kamala eventually began to play with other children and learnt about a dozen words, dying in 1929[32]. Bettelheim believed that Amala and Kamala "were probably utterly unacceptable to their parents for one reason or another. This is characteristic of all autistic children, no matter of what age; the parents manage to disengage themselves from them by placing them in an institution (...), or by setting them to fend for themselves in the wilderness, or, the most likely, by not pursuing them when they run

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[28] Bettelheim, B., *Schizophrenic Art: A Case Study*. Scientific American, 1952: p. 30.

[29] Bettelheim, B., *Joey: A "Mechanical Boy"*. Scientific American, 1959. **200**(3): p. 116-27.

[30] Bettelheim, B., *Love is not Enough*. 1950, Glenco, Ill.: Free Press.

[31] Bettelheim, B., *The Empty Fortress: infantile autism and the birth of the self*. 1967, New York: Free Press.

[32] MacLean, C., *The Wolf Children*. 1977.

away"[33]. Bettelheim concluded that "feral children seem to be produced not when wolves behave like mothers, but when mothers behave like nonhumans"[34].

In her classic study of autism, Uta Frith considers other cases of feral children, notably The Wild Boy of Aveyron and Kaspar Hauser. The latter was found in Nuremberg in 1828 with a letter addressed to the captain of the cavalry requesting that he should be allowed to serve as a soldier, and giving the date of his birth as 1812. His verbal ability was largely limited to the repetition of one rote-learned phrase to the effect that he wanted to be a cavalryman like his father, but he could nevertheless write his name and the letters of the alphabet. He was unable to walk, evidently through lack of practice, and appeared to have been kept in a cellar with a wooden rocking-horse for many years and fed only bread and water. Hauser grew two inches in a few weeks, began to have dreams, and learned avidly—eventually even mastering some Latin. He was found to have an excellent memory, despite almost complete amnesia about his past. Although his senses seemed unusually acute, he lacked perception of visual depth so that he was unable to correctly judge the size of objects seen at a distance. He was reported to have been "astonished at the discovery of an invisible inner world of the mind" and was eventually murdered by an unknown assassin on a second attempt in 1833[35].

The Wild Boy of Aveyron was found thirty-odd years earlier, scarred, naked and living wild in woods where he had been sighted for a couple of years before his capture. Believed to be aged about 12 at that time, he was found to be mute—but not deaf—and completely asocial. A local physician, Dr Itard, attempted to educate him with limited success and published a book on the case in 1801. Anticipating Bettelheim's view of autism, Itard has been described as believing that "a human being was a social construct" and that the Wild Boy's deficits were "due not to any inherent genetic failure, but simply to the fact that he had been excluded from human society at a vital stage in his development. His idiocy was thus due not to nature, but to the lack of nurture"[36]. Although the Wild Boy learned some sign language, he never spoke or developed any significant social skills or attachments. By contrast, Hauser developed so far and so fast in respects of language and social skills that some claimed he was a fraud, and had never in fact been incarcerated as he claimed[37].

A careful analysis of both cases leads Uta Frith to conclude that the Aveyron boy perhaps was a case of autism, but that Kaspar Hauser probably was not. On the

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[33] Bettelheim, B., *Feral Children and Austistic Children.* American Journal of Sociology, 1959. **64**: p. 455-67.

[34] Bettelheim, B., *Feral Children and Austistic Children.* American Journal of Sociology, 1959. **64**: p. 455-67.

[35] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[36] Kitchen, M., *Kaspar Hauser: Europe's Child*. 2001, Houndmills, Basingstoke, Hampshire: Palgrave. 239.

[37] Kitchen, M., *Kaspar Hauser: Europe's Child*. 2001, Houndmills, Basingstoke, Hampshire: Palgrave. 239.

contrary, Frith deduces that Hauser was almost certainly a case of severe neglect and resembled the Romanian orphans who were brought to the UK for adoption in the 1980s. Most of these 165 children were under a year old (although some were well over) and all had suffered serious neglect in over-crowded orphanages. By the age of four most had recovered, but 11 children who were older than the rest showed symptoms reminiscent of autism, such as difficulties in forming normal relationships, deficits in speech and conversation, compulsive touching and smelling, and narrow interests in things like watches, vacuum cleaners, and plumbing. However, by age 6 most of these symptoms had vanished or ameliorated and Frith concludes that, contrary to what Bettelheim would have predicted, these children did not in fact have autism. Instead, she concludes that they suffered from a developmental delay in aspects of social and non-social development than can mimic autism. Evidence for this can be found in the remarkable fact that intelligence scores increased by 20 points in the group of eleven "quasi-autistic" orphans, compared to an average increase of only 7 points in the rest of the group[38].

Despite Bettelheim's often repeated claims of spectacular therapeutic success, objective evidence of it is hard to come by. Indeed, when challenged by a reviewer to produce real evidence in relation to his treatment of alleged autistic children, Bettelheim stated that "I wanted the reader to form his opinion on the basis of the clinical material. This he can evaluate by his own empathy, and in terms of its inner logic, and not by any reliance on figures which, however carefully checked by my associates, and against our records, would still have to be accepted on my say so"[39]. But according to the testimony of Jacquelyn Seevak Sanders, Bettelheim's primary assistant and hand-picked successor at the Orthogenic School, "you couldn't believe anything Bettelheim said"[40]. Despite having only a single doctorate in philosophy without honours, Bettelheim claimed to have passed doctoral degrees *summa cum laude* in three subjects, adding psychology and art history. Additionally he falsely asserted that he had "training in all fields of psychology", and even to have "studied with Freud"! In his application for the Ford grant and repeatedly throughout his life, Bettelheim claimed to have had two autistic children who lived with him in his home for many years, and whom he successfully treated. In reality, Patricia Lyne was the only child the Bettelheims took into their home in Vienna, and she was never diagnosed as autistic. Indeed, she later wrote that "Bruno did not play any role in bringing me up"[41].

Clearly, Bettelheim's "say-so" hardly inspires confidence, and certainly does not do so in relation to his controversial claims of therapeutic success, which systematic

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[38] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[39] Bettelheim, B., *Reply by Bruno Bettelheim.* American Journal of Orthopsychiatry, 1968. **38**(5): p. 932.

[40] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[41] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

follow-up studies by others showed were characteristic mixtures of lies and exaggerations[42]. Indeed, even where his ostensible successes are concerned, Bettelheim's talent for misrepresentation gives grounds for suspicion. William Blau, a "counsellor" (or, less pretentiously, a teacher) employed at the Orthogenic School in the late 1940s and who quickly came to regard Bettelheim as a bullying cult leader, said that in his experience none of the children seemed to him to be nearly as disturbed as Bettelheim proclaimed them to be. One explanation may be that Bettelheim told a colleague to be sure to admit some children whom he knew not to be too disturbed, adding that "You need to develop some credibility in the community, and the way to do it is to show some successes"[43].

Bettelheim claimed that the regime at the Orthogenic School under his direction distilled therapeutic insights from his experience in concentration camps, and there certainly were some arresting parallels. At his insistence, children were separated from their parents for years at a time and often denied intervening visits[44]. As one former student put it in a recently published autobiographical account of his experiences at the school, "I was a prisoner as surely as any prince locked in the Tower or the Bastille"[45]. Indeed, many children under his care served longer sentences than Bettelheim himself had done in the concentration camps.

Although Bettelheim condemned corporal punishment in his public pronouncements, he used it regularly himself at the Orthogenic School, and encouraged others to do the same. Even though the writer from whom I have just quoted seems to have retained a remarkably positive attitude towards the man who everyone—himself included— called "the Big Bad Wolf", even he admits in passing that he was regularly slapped a couple of times a month by Bettelheim[46]. But other children were not so fortunate. According to testimony given to one recent biographer,

> Alida Jatich wrote that she lived in terror of the director, who, when she was fifteen, pulled her naked out of a shower and beat her in front of a room full of dormmates and counsellors. She said that he was angry because she was withdrawn and did not want to socialize with her peers and because she generally disapproved of him and the school. "He started slapping me

[42] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[43] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[44] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[45] Eliot, S., ed. *Not the Thing I Was: Thirteen Years at Bruno Bettelheim's Orthogenic School*. 2002, St Martin's Press: New York. 288.

[46] Eliot, S., ed. *Not the Thing I Was: Thirteen Years at Bruno Bettelheim's Orthogenic School*. 2002, St Martin's Press: New York. 288.

over and over, dragging me out by the hair. I tried to grab a towel to cover myself but was not able to do that."[47]

Other girls were routinely beaten with a belt, while boys were beaten for masturbating at times, then encouraged to do so at others. A number of other former students allege serious sexual assaults, and one reported going to bed with multiple layers of underwear on to try to protect herself from Bettelheim's nocturnal groping. Bettelheim claimed that he fondled the breasts of girls after beating them "to show them he loved them". Yet another former resident wrote that there was "always— always— a visceral, stomach-tightening ... terror in all when [Bettelheim] made his nocturnal and afternoon approaches"[48]. Bettelheim's deputy and successor, Jacquelyn Sanders, later admitted that "we became abusers of abused children," that "children who had aggressive tendencies identified with this aspect of our approach," and that "we became actors in sexual-sado-masochistic fantasies"[49]. The biographer who published these findings concludes that "physical and emotional abuse was a part of everyday life at the Orthogenic School." He adds that Bettelheim "did not hit or invade the privacy of every child... but everyone saw or heard about his frightening explosions, and no one was exempt from the anxiety they produced, an anxiety that in some cases did make the children feel like frightened prisoners"[50].

* * *

If contact with extra-terrestrial beings were to occur in reality, quarantine would hopefully just be a preliminary to an effort to communicate with them and to find out who or what they really were. Science fiction often portrays alien beings as immediately able to understand and to communicate with humans—even to the point of speaking English and having excellent manners! But a moment's reflection is enough to show that in reality things would probably be very different. Human technology and material culture might be pretty much self-evident to any intelligent being able to travel here or communicate with us, simply because material culture exploits principles of science and technology which are universal. But we have no way of knowing whether the fundamental principles of human behaviour would be as self-evident to an extra-terrestrial species which might be biologically very different from us. It might take some time and careful analysis for aliens to begin to understand what are self-evident realities to us, such as the self, consciousness, or personal moral responsibility. The very idea of the mind as an entity might be alien to the aliens, whose initial

[47] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[48] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[49] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[50] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

reaction to human beings might be wholly behavioural and completely lacking in the appreciation of mental factors such as intention, meaning, and emotion. In other words, extra-terrestrials might regard us as we might creatures very different from ourselves, such as plants, insects, or bacteria. And at the very least, actual extraterrestrials, like human anthropologists who visit foreign cultures, would have to learn our languages and understand our cultural conventions: they would be Martian anthropologists on Earth, if you like.

Admittedly, this is just speculation about something that will almost certainly never happen. But here again, there is a striking parallel with autism. By contrast to the incomprehension of the past, today many symptoms of autism are understood in terms of one specific deficit: that relating to the mind and an ability to understand and interpret your own and other people's behaviour in purely mental terms. Here autistics show characteristic short-falls which go a long way to explaining their own feeling of being aliens from human society (not to mention the alienation and rejection that they commonly experience from other human beings who simply cannot understand them). Like real extra-terrestrials might be expected to be, many autistics are either totally mute or have serious verbal shortcomings, and even when they can speak they often interpret things said to them too literally, completely fail to understand metaphors, or show an inability to see what is funny in a joke. And again like any actual aliens you could realistically imagine and who would almost certainly be physically very different from ourselves, autistics are poor at recognizing and interpreting emotional expressions, gestures, and body-language.

Where social deficits are concerned, autism has been graphically described as "mind-blindness"[51]. Originally, the equivalent German term, *Seelenblindheit*, was coined by the neurologist, Heinrich Lissauer (1861-1891) to describe blindness whose cause lay not in the eye but in the brain (what is today known as *blind-sight*[52]). Here I shall use the term exclusively in the modern sense and interpret it to mean figurative blindness to what is in another person's mind—or indeed, even in your own.

It is certainly the case that autistic people can be distressed by their inability to understand what other people are thinking or feeling. For example, one young autistic man complained that he couldn't "mind-read". He explained that other people seem to have a special sense by which they can read other people's thoughts and anticipate their responses and feelings. He knew this because they managed to avoid upsetting people whereas he was always "putting his foot in it": not realizing that he was doing or saying the wrong thing until after the other person became angry and upset ([53] quoting[54]). But this problem is not linked in any way to deficits in intelligence,

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[51] Frith, U., *Autism: explaining the enigma*. 1989, Oxford: Blackwell. 204.

[52] Weiskrantz, L., *Blindsight: A Case Study and Implications*. Oxford Psychology Series, ed. D.E. Broadbent, et al. Vol. 12. 1986, Oxford: Clarendon Press. 187.

[53] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[54] Rutter, M., *Cognitive deficits in the pathogenesis of autism.* Journal of Child Psychology and Psychiatry, 1983. **24**: p. 526.

education, or opportunity. The philosopher, A. J. Ayer (1910-89) for example, who has been posthumously diagnosed with an autistic disorder, once remarked that none of his philosophical preoccupations had given him "as much trouble as the problem of our knowledge of other minds"[55].

A critical assessment of such deficits is the so-called *false belief* or *Sally-Anne test*. In the simplest version, a child is shown a tube of sweets and asked what they think is inside. Of course, the child replies, "sweets!" But the tube is opened to reveal a pencil. The child is then asked what another person, who has not yet been shown the tube and its unexpected contents, will think is inside it. Alternatively, a child is shown two dolls, Sally and Anne, each of which has a toy box. The child sees that Sally has a toy in her box, but Anne does not. Now the child is asked to imagine that Sally leaves the room, and while she is absent, Anne takes Sally's toy out of Sally's box and puts it into her own box, and shuts it again. Now Sally returns. The crucial question is: where does Sally think her toy is now? The majority of four-year old children can appreciate Sally's false belief that her toy is still in her box despite the fact that they personally know that it is not, but autistic children even considerably older typically reply that Sally now thinks that her toy is in Anne's box. Exactly the same happens with the tube of sweets: most four-year-olds realize that someone not shown the pencil inside would think it contained sweets, but autistic children typically fail to understand this. Such reactions are taken to indicate that those who fail the tests are answering on the basis of their own knowledge, and seem unable to appreciate others' ignorance because they lack the ability to understand another person's different state of mind[56][57].

The Sally-Anne/sweet-tube test may sound so elementary to most adults that they fail to see how anyone could fail it. But many people in the modern world have probably experienced at least one situation where they are likely to feel sure that another adult has in effect failed the test. This is in the common experience of finding that instructions provided for assembling flat-packed goods, or operating new gadgets, machines, or software fail in their intended aim. Frustrated users are likely to insult the intelligence of the authors of the instructions, or impugn their good faith in genuinely wanting them to succeed. But the truth is often likely to be that the instructions have been written by those who already fully understand the product whose use or assembly they are trying to explain to beginners.

Such failures in communication may often be attributable to the fact that the authors of the instruction manual understand the situation so well that they find it hard—if not impossible—to imagine how a complete beginner will feel, and allow their easy expertise to obscure their comprehension of the difficulties of their readers. Fur-

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[55] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[56] Wimmer, H. and J. Perner, *Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception*. Cognition, 1983. **13**: p. 103-128.

[57] Baron-Cohen, S., A.M. Leslie, and U. Frith, *Does the autistic child have a 'theory of mind'?* Cognition, 1985. **21**: p. 37-46.

thermore, the same reasoning probably explains why the most brilliant academics are often the worst teachers—particularly when it comes to teaching novices. It may simply be that they find the subject so easy and so obvious that they fail to appreciate the difficulties it holds for beginners who do not share their existing knowledge and habitual mastery of the subject. But clearly, teachers need to be able to understand what their students do not know before they can successfully teach them what they themselves know already. In short, understanding others' state of awareness is the essence of the Sally-Anne/sweet-tube test, and the frequency with which printed or didactic instruction fails in its intended purpose is testimony enough to the fact that inability to appreciate false belief is certainly not confined to childhood and to autism but can be found throughout life and in otherwise perfectly normal people.

According to Premack and Woodruff, who originated the term, *theory of mind* describes the ability to infer that other people experience mental states like our own. They claim that such a capacity may properly be viewed as a theory because mental states are not directly observable, and can be used to make predictions about the behaviour of others[58]. Experiments like the Sally-Anne test described above suggest that normal children acquire a theory of mind between the ages of three and five, but that autistic children are notably lacking in this respect. Studies show that autistic children do not differ from others in their ability to understand the functions of an internal organ like the heart. Nor are they deficient in their knowledge about the location of organs such as liver or brain. However, whereas other children are able to understand that the brain has purely mental functions, autistic children tend to associate it only with behavioural functions, so that it appears that specifically mental, unobservable events are beyond their comprehension[59].

Today a great deal of evidence of many kinds has accumulated in support of the view that theory-of-mind deficits characterize autism[60][61]. Indeed, the latest research has even begun to reveal the brain structures that might be involved. In a recent experiment using brain-imaging, 10 autistic and 10 normal subjects viewed animations of two moving triangles on a screen in three different conditions: moving randomly, moving in a goal-directed fashion (chasing, fighting), and moving interactively with implied intentions (coaxing, tricking). The last condition frequently elicited descriptions in terms of mental states that viewers attributed to the triangles. The autism group gave fewer and less accurate descriptions of these latter animations, but equally accurate descriptions of the other animations compared with controls. While viewing animations

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[58] Premack, D. and G. Woodruff, *Does the chimpanzee have a theory of mind?* Behavioral and Brain Sciences, 1978. **1**(4): p. 515-526.

[59] Baron-Cohen, S., *Are Autistic Children "Behaviourists"? An Examination of Their Mental-Physical and Appearance-Reality Distinctions.* Journal of Autism and Developmental Disorders, 1989. **19**(4): p. 579-600.

[60] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[61] Baron-Cohen, S., H. Tager-Flusberg, and D.J. Cohen, eds. *Understanding Other Minds*. 2000, Oxford University Press: Oxford. 530.

that elicited mentalizing, in contrast to randomly moving shapes, the normal group showed increased activation in parts of the brain previously identified with theory of mind functions. The autism group showed less activation than the normal group in all these regions. As the researches comment: "The claim that individuals with autism spectrum disorders, regardless of general intelligence, have an impairment in the attribution of mental states, has been confirmed once again"[62]. According to another authority, "we can now take for granted that there is such a thing as 'mentalizing,' and that the probably innate physiological basis of this ability is at fault in autism. The neural network that supports mentalizing can already be seen through a scanner"[63].

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Although alien beings arriving on Earth might indeed reveal deficits in their ability to understand human minds comparable to those found in autistics, it is also possible that they might nevertheless understand things which we do not—perhaps precisely because of their limitations. For example, simply because they were not human, extraterrestrial visitors to the Earth might not make the sharp distinction that we make between ourselves and animals. On the contrary, they might take the wholly objective view that we were just one animal species among many, and perhaps appreciate as much about other species as they failed to understand about us. At the very least, they might be expected not to share our view of human pre-eminence and superiority over the rest of creation, and certainly, something very similar appears to be true of some autistics.

A case in point is Temple Grandin, one of the world's best known—and certainly, most eminent—autistics. She recalls that as a two-year-old child she showed the symptoms of classic autism: no speech, poor eye contact, tantrums, appearance of deafness, no interest in people, and constant staring off into space[64]. The psychiatrist and writer Oliver Sacks, meeting her in adult life, reported that Temple Grandin seemed largely devoid of an implicit knowledge of social conventions and of cultural pre-suppositions which most normal people accumulate throughout life on the basis of experience and encounters with others. Lacking it, she had instead to "compute" others' intentions and states of mind, to try to make formal and explicit what for the rest of us is second nature[65].

But whatever her shortcomings where comprehension of the characteristically human mind is concerned, Temple Grandin's expertise in understanding the animal mind is so great that her services as a consultant on animal behaviour are widely sought, and she has become an acknowledged international authority on the humane handling of cattle. Indeed, in the words of Marian Stamp Dawkins,

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[62] Castelli, F., et al., *Autism, Asperger syndrome and brain mechanisms for the attribution of mental states to animated shapes.* Brain, 2002. **125**(8): p. 18391849.

[63] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[64] Grandin, T., *Thinking in Pictures and other reports from my life with autism*. 1995, New York: Vintage Books. 222.

[65] Sacks, O., *An Anthropologist on Mars: Seven Paradoxical Tales*. 1995, London: Picador. 318.

> she has arguably done more than anyone else in the world to improve the welfare of animals in a practical way. Her major contribution has been to go into places that most of us would probably prefer not to think about—slaughterhouses—and imagine what it would be like to be an animal on its way to being killed. She has dramatically improved the welfare of these animals, not by making any expensive modifications to the slaughter plants but by suggesting simple changes that cost nothing, such as removing a yellow coat hanging over a grey fence, or altering the lighting to eliminate shiny reflections from a puddle. By removing stimuli that frighten cattle and cause them to stop and pile up on one another, the cattle move more easily, they don't slip and fall, and the use of electric goads is almost unnecessary. These things are all very simple and effective. It's just that no one had thought of them before.[66]

As Grandin herself puts it in her most recent book, "Autism made school and social life hard, but it made animals easy"[67]. Indeed, she remarks that "Autism is a kind of way station on the road from animals to humans..."[68]. Speaking of herself as an autistic, she adds that "We use our animal brains more than normal people do, because we have to. We don't have any choice. *Autistic people are closer to animals than normal people are*[69] [author's emphasis]. According to another autistic woman, "an autistic person regards her environment the same way as an animal"[70]. Certainly, in the following comments of Grandin's recorded by Sacks about a cow that had been separated from her calf mental states are inferred and predictions made about them in just the way that Premack and Woodruff argued typify a true theory of mind:

> "That's not a happy cow," Temple said. "That's one sad, unhappy, upset cow. She wants her baby. Bellowing for it, hunting for it. She'll forget for a while, then start again. It's like grieving, mourning—not much written about it. People don't like to allow them thoughts or feelings. Skinner wouldn't allow them."[71]

The reference to Skinner is, of course, to the behaviourist, Burrhus Frederic Skinner (1904-90). As an undergraduate, Temple Grandin met Skinner. Before the meeting she

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[66] Dawkins, M.S., *An autistic look at animals*. Nature, 2005. **435**: p. 147-8.

[67] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. 2005, New York: Scribner. 357.

[68] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. 2005, New York: Scribner. 357.

[69] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. 2005, New York: Scribner. 357.

[70] O'Neill, J.L., *Through the Eyes of Aliens: A Book About Autistic People*. 1999, London: Jessica Kingsley. 144.

[71] Sacks, O., *An Anthropologist on Mars: Seven Paradoxical Tales*. 1995, London: Picador. 318.

saw him as a divine being, indeed, "He was the god of psychology," and visiting him was "like going to see the Pope in the Vatican. . But when I went into his office, it was a big letdown. He was just a normal-looking man." Indeed, with characteristic autistic candour she recounts that the god-like psychologist revealed his feet of clay when he tried to grope his undergraduate admirer! But Grandin put him in his place, observing that while he might look at her legs, he was not permitted to touch them: an exercise in negative re-inforcement that seems to have worked as well on the great behaviourist as on any laboratory animal[72].

Behaviourism derived its name from its dogmatic assertion that the mind was a "black box" that could not be opened and about whose internal workings science could not speculate. According to Skinner, words like "mind" and "ideas" were "invented for the sole purpose of providing spurious explanations". And because "mental or psychic events are asserted to lack the dimensions of physical science, we have an additional reason for rejecting them." Skinner's fellow behaviourist, John B. Watson (18781958), proclaimed that "the time has come when psychology must discard all reference to consciousness" and be purged of "all subjective terms such as sensation, perception, image, desire, purpose, and even thinking and emotion as they are subjectively defined"[73]. All that could be studied objectively was what went into the brain in the form of stimuli and what came out of it as observed behaviour. Nothing else could be said. Behaviourism was the study of behaviour, not of the mind—mind-blind psychology, if ever there was.

At much the same time that Behaviourism was becoming dominant in the West, the teachings of the founding father of behaviourist psychology, Ivan Pavlov (1849-1936) were proclaimed official dogma in the Soviet Union, becoming in the words of one historian "hypertrophied to the point of absurdity" in the process. Anyone of a different mind was persecuted as an "idealist" and "deprived of normal opportunities to carry out scientific work"[74]. Pavlov's fundamental discovery was of course conditioning, and the fact that you could condition dogs to salivate at the sight of a technician's white coat or the sound of a bell suggested that all behaviour was learned. Indeed, Watson asserted that psychology no longer had any need of the term "instinct" because "Everything we have been in the habit of calling an instinct today is largely the result of training". Even breathing or the beating of the heart was seen as "an unlearned act ... becoming conditioned shortly after birth"[75]. Watson boasted that with behaviourist conditioning he could mould a child to any desired psychological specification:

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[72] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. 2005, New York: Scribner. 357.

[73] Wallace, B.A., *The Taboo of Subjectivity*. 2000, Oxford: Oxford University Press.

[74] Medvedev, Z.A., *The Rise and Fall of T. D. Lysenko*. 1969, New York: Columbia University Press. 284.

[75] Gould, J. and C. Gould, *The Animal Mind*. 1994, New York: Scientific American Library. 236.

> we no longer believe in inherited capacities, talent, temperament, mental constitution, and characteristics. Give me a dozen healthy infants, well formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, merchantchief and yes, even beggar-man and thief, regardless of the talents, penchants, tendencies, abilities, vocations, and race of his ancestors. [Watson, 1970 #230 p. 104]

In like manner, Skinner claimed that "All behavior is constructed by a continual process of differential reinforcement from undifferentiated behavior, just as a sculptor shapes his figure from a lump of clay"[(76)]. Here the "sculptor" is a metaphor, but in reality behaviourism appeared to give enormous influence to persons who could mould the behaviour of others, such as parents, professors, and politicians. Perhaps it was the fact that behaviourism extolled the power of conditioning to an extreme degree and reduced the mind to little more than a blank slate that made the doctrine so appealing to totalitarian regimes like that in the Soviet Union. Clearly, the Marxist doctrine that consciousness originates in society fitted nicely with Pavlovian conditioning to suggest that that the mind of the individual could be discounted completely and moulded in whatever way that the higher powers of politics dictated.

But such a denial of the mind was not limited to behaviourist psychologists or Marxist thought-police. According to George Williams, one of the most eminent of twentiethcentury Darwinists:

> only confusion can arise from the use of an animal-mind concept in any explanatory role in biological studies of behaviour. . Mind may be self evident to most people, but I see only a remote possibility of its being made logically or empirically evident
>
> ... I feel intuitively that my daughter's horse has a mind. I am even more convinced that my daughter has. Neither conclusion is supported by reason or evidence. Only if it violates physical laws would mind be a factor that biologists would have to deal with. . There is no such evidence for mind as an entity that interferes with physical processes, and therefore there can be no physical or biological science of mind. . no kind of material reductionism can approach any mental phenomenon.[(77)]

Williams concludes that the "solution to the non-objectivity of mind" is "to exclude mind from all biological discussion". Elsewhere Williams castigates what he calls "lubricious slides into discussions of pleasure and anxiety and other concepts proper to the mental domain" as nothing other than "flights of unreason" on the part of authors

[(76)] Gould, J. and C. Gould, *The Animal Mind*. 1994, New York: Scientific American Library. 236.

[(77)] Williams, G., *A Defense of Reductionism in Evolutionary Biology*, in *Oxford Surveys in Evolu-*

who "claim to have provided a physical explanation of mental phenomena"[78] Similar comments to those of Williams can be found in the work of the ethologists, Niko Tinbergen (1907-88) and Konrad Lorenz (1903-89). These writers concentrated on observed behaviour and mistrusted mental terms, which were often dismissed as "anthropomorphic" (that is, committing the error of attributing human thoughts and feelings to animals). Such views have been perpetuated and popularized by their pupils, such as Richard Dawkins, according to whom "Ethologists . do not permit words like 'fear', 'anger', 'libido' and even 'hope', but only as formally defined intervening variables or hypothetical constructs"[79].

Such a conscious, intentional rejection of all things mental is certainly comparable to the involuntary and unintentional mind-blindness of autistics, but perhaps deserves a term of its own. My suggestion would be *anti-mentalism*. As such, the term designates a rational belief rather than a cognitive deficit—an anti-mind theory, if you like. But whatever you care to call it, such behaviouristic anti-mentalism was typical of most twentieth-century Darwinists and many students of animal behaviour. The result of such views was what you might call evolutionary, genetic, or ethological behaviourism: "explanations" of behaviour that went directly from the evolutionary, genetic, or ethological factors proposed to the observed behavioural result. Such an approach neglected the mental level of explanation altogether, and at times left you wondering why organisms should be regarded as possessing minds at all—so irrelevant did they seem to behaviour. Where human beings were concerned, evolutionary, genetic, or ethological behaviourism prompted understandable protests that such an approach was "reductionistic" and diminished people to the status of mindless robots, controlled by their genes or ethological programming to act in ways essentially no different from the ways in which an ant or an amoeba might behave. Indeed, wherever it was found anti-mentalism appeared to do exactly what Bettelheim accused the parents of autistics children of doing: dehumanizing people by treating them as if they were robots, animals, or aliens.

Another virtue of the concept of anti-mentalism is that it implies the existence of what it negates. *Mentalism* was a term that was originally used to describe stage acts in which the performer appeared to be able to read other people's thoughts—a feat which was also called "mind-reading". However, the term is also used in philosophy and psychology to describe what behaviourism attempted to rule out: the belief that the mind is real and that our subjective experience of it provides valid insights for these disciplines. This is the exact contrary of anti-mentalism and describes the essential deficit in mind-blindness: the tendency to infer, interpret and predict mental states

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tionary Biology, R. Dawkins and M. Ridley, Editors. 1985, Oxford University Press: Oxford. p. 1-27.

[78] Williams, G.C., *Plan and Purpose in Nature*. 1996, London: Weidenfeld & Nicolson. 191.

[79] Dawkins, R., *Reply to Lucy Sullivan.* Philosophical Transactions of the Royal Society B, 1995. **349**: p. 212-224.

in yourself and others—perhaps animals included—in other words, to mindread or to mentalize[80].

An advantage of thinking in terms of mentalism is that it allows us to dispense with the cumbersome phrase "theory of mind" along with the misleading implications it carries with it, such as the impression it gives that people's mentalistic abilities spring from a prior conceptual understanding of psychology. This is clearly not the case, because mentalism is an implicit, automatic, unconscious ability that comes as naturally to most normal people as walking or talking. And just as no one needs to study the grammar and syntax of their native tongue in school before being able to speak it competently, or learn anatomy and mechanics before being able to walk, so no normal person needs a course on theory of mind before they can interact socially with other human beings. Theory of mind, in other words, is not a consciously learnt body of propositions like the Special Theory of Relativity or theory of music.

Temple Grandin's attempts to compensate for her mentalistic deficit by consciously thinking "algorithmically" about human social interactions is what you might call a true "theory of mind" because it is something she has had to learn, apply intentionally, and think about conceptually:

> Since I don't have any social intuition, I rely on pure logic, like an expert computer program, to guide my behavior. I categorize rules according to their logical importance. It is a complex algorithmic decision-making tree. There is a process of using my intellect and logical decision-making for every social decision. Emotion does not guide my decision; it is pure computing. ... Using my system has helped me negotiate every new situation I enter.[81].

So, paradoxically, autistics like Grandin do have theories about the mind—or, at least, about other people's minds—because this is the only way they can compensate for the lack of the implicit, automatic, unthinking ability to understand the mind that the phrase "theory of mind" was intended to describe. However, the term "theory of mind" is too well established in the literature to be avoided entirely. So from now on I shall treat it as a phrase equivalent to mentalism, and prefer *mentalism* and *mentalistic* as the noun and adjective that refer to the same fundamental concept: human beings' ability to understand their own minds and behaviour and the minds and behaviour of others in purely mental terms. Indeed, to this extent mentalism can be seen as equivalent to "mind-reading", "folk psychology", "social intelligence", "mentalizing",[82] or "mindness"[83].

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[80] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[81] Grandin, T., *Thinking in Pictures and other reports from my life with autism*. 1995, New York: Vintage Books. 222.

[82] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[83] Llinas, R.R., *I of the Vortex*. 2001, Cambridge Mass.: MIT Press. 302.

More recently, *empathising* has been suggested as another alternative to theory of mind[84]. Clearly, this is intended to avoid exactly the same difficulties with theory of mind that we have just been looking at, and adds an emotional, implicit dimension to mind-reading understood in opposition to mind-blindness. But as Temple Grandin's remarks above again show, it is not "empathising" as such that characterizes her autistic deficit, but her inability to empathize with human beings. As we saw, she has if anything an enhanced ability to empathize with animals and their feelings, but this seems to contribute little or nothing to her ability to understand people:

> The work I do is emotionally difficult for many people, and I am often asked how I can care about animals and be involved in slaughtering them. Perhaps because I am less emotional than other people, it is easier for me to face the idea of death. . However, I am not just an objective, unfeeling observer; I have a sensory empathy for the cattle. When they remain calm I feel calm, and when something goes wrong that causes pain, I also feel their pain. I tune in to what the actual sensations are like to the cattle rather than having the idea of death rile up my emotions. My goal is to reduce suffering and improve the way farm animals are treated.[85]

Again, cases can be found where autistics empathize to an astonishing extent not merely with animals, but even with totally inanimate or even abstract objects as the following quotation from another autistic shows:

> I remember being very upset about being introduced to the spelling concept of dropping the "e," if one exists, at the end of a word when one adds the suffix -ing. My concern over the letter was so great that I talked about it during a counselling session with a psychiatrist I was seeing at the time. He drew the letter of concern on a piece of paper and let it fall to the floor. I had to go to rescue it. I truly felt bad for this letter that was cast aside and dropped to the floor. It was much easier for me at that time to imbue this inanimate object with feelings than people because humankind is full of unpredictable emotions that can be difficult to decode. It was [as] if the object had feelings of its own. Even now, when I see an object damaged I feel badly for it.[86]

All this suggests that it is the peculiarly human, psychological aspects of being able to empathize with other human beings' mental experience that is lacking in autism,

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[84] Baron-Cohen, S., *The essential difference: Men, women, and the extreme male brain.* 2003, London: Allen Lane.

[85] Grandin, T., *Thinking in Pictures and other reports from my life with autism.* 1995, New York: Vintage Books. 222.

[86] Shore, S., *Beyond the Wall: Personal Experiences with Autism and Asperger Syndrome.* 2001,

not simply empathy as such. To the extent that this is implied and assumed in the use of "empathising" in this context, it could be seen—along with "theory of mind", "mentalizing", and "folk psychology"—as an alternative formulation for what I would prefer to call mentalism. Admittedly, if mentalism were a concept purely appropriate to autism, there might be little point in advocating it in preference to the others we have already discussed. But as I hope to show in the course of this book, the concept of mentalism as introduced here has much wider ramifications than any of the alternatives suggested so far. At the very least, it has a merit as a single noun with an already-current adjective as an alternative to phrases like "theory of mind" and "folk psychology", or verbs such as "mentalizing". This alone might be a good enough reason for advocating the use of mentalism in preference.

Finally, the history with which we began suggests one last reason for preferring mentalism to "empathising". This is that however empathic Bettelheim's approach to autism may have claimed to be—and this is a claim inherent in all psychotherapy—the practical consequences were anything but empathic in reality. As the biographer from whom I quoted earlier observed, although Bettelheim pretended that he ran the Orthogenic School in a much more humane fashion, his readiness to strike and threaten the children—not to mention tyrannizing the staff much of the time—owed more to the behaviourism of Skinner than to the ideals of Freudian psychotherapy[87].

Temple Grandin protests that "There's so much psychodrama in normal people's lives," but there was vastly more at the Orthogenic School[88]. Indeed, life there was one long psychodrama for everyone. Emmy Sylvester, a leading assistant from the beginning described Bettelheim as follows: "He was a very bright guy, no doubt about it. But he was also a bad character, full of the lust for power, an absolute monarch, always manipulating people: the kids at the school, the staff, his collaborators"[89]. Staff meetings were used to dissect the counsellors as well as the students' behaviour:

> He saw the sessions "as instruments for challenging staff members to confront themselves He would get into your parents, your brother, your whole personality," recalled Shelton Key, a counsellor and teacher at the school from 1953 to 1962, who was often so shaken after evening staff sessions that he could not sleep. Few of the staff meetings ended without at least one of the women in tears and several others fighting them back. "When there was a staff meeting before lunch," recalled one former resident, "you

Shawnee Mission, Kansas: Autism Asperger Publishing Co. 174.

[87] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[88] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. 2005, New York: Scribner. 357.

[89] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

> would see many staff members come into the dining room with eyes red from crying."[90]

On one occasion, Bettelheim suddenly started to slap a child across the face after a comment about her from her counsellor, Nina Helstein, who was deeply shocked. Later Bettelheim asked her about the child, and Helstein made a comment about the child's behaviour. Bettelheim then replied with a remarkable interpretation even for a so-called psychoanalyst:

> "That's right. So when a child is upset, why would you have me hit her?" Helstein was numb with dread at the prospect of challenging her world-famous employer, but somehow managed to say, "Dr B. you do not hit children because I tell you to, you did that." She said he was enraged by her effrontery. "It was insane. A lot of what went on at the school was, and the staff members went along with it."[91]

Insane it might have been, but quintessentially mentalistic it certainly was, and the reason that the staff went along with it was that such manipulation can be highly effective—especially when exploited by so ruthless, dishonest, and domineering a character as Bettelheim.

Bettelheim like other Freudians took a strongly pro-mentalistic stance in the sense that he extended the concept of the mind to include the unconscious, and shared the movement's tendency to find hidden motives for anything and everything with a complete disregard for fact or physical foundation. For example, some critics pointed out that Bettelheim and his colleagues appeared to be extraordinary mind-readers. Bettelheim reports that one boy

> picked up a sandwich at his first meal, bit into it and then put it down. Provocatively, he picked up another one, took a little bite, and put it down. And this he continued with another and another until he had bitten into eight altogether. By then, he began to wonder if we might not, contrary to his expectations, be more interested in allowing him the freedom to behave in line with his emotional need to waste food, than we were in saving food or in enforcing good manners at the table.[92]

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[90] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[91] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim*. 1997, New York: Simon & Schuster. 478.

[92] Bettelheim, B., *Love is not Enough*. 1950, Glenco, Ill.: Free Press.

But as a reviewer pointed out, this is a remarkable insight for an emotionally disturbed child to have at his first meal in a strange new institution [[93] quoting Virginia Axline's review of Love is Not Enough in The Journal of Abnormal and Social Psychology, 46, #3 (July 1951) p. 449.] Indeed, psychoanalysis as a whole became notorious for such over-interpretation of peoples' motives and intentions, and as we shall see in later chapters, mentalism can be as much of a menace to mental health if it is over-extended as autism shows it to be if it is deficient. In other words, although you can hardly have too much empathy, you most decidedly can overdo mentalism, and this in itself is a good enough reason for adopting the concept.

[93] Pollack, R., *The Creation of Dr. B: A Biography of Bruno Bettelheim.* 1997, New York: Simon & Schuster. 478.

2. Asperger's Syndrome, Savants, and Male Mentality

When extra-terrestrials are portrayed in science fiction, they are very often credited with superior intelligence, technology, or scientific knowledge. Indeed, this is more or less unavoidable if they are to be believed to have the ability to travel here from other planets. Such a challenging feat obviously implies an advanced intellect—at least where technical know-how is concerned—and alien intelligence might be expected to transcend many of the limitations of the human mind where basic functions like memory, mathematical or logical reasoning, or originality were concerned. And once again there is a striking parallel with autism. As we shall now see, some autistics at least approximate very closely to what we might imagine aliens to be like in this respect and sometimes show compensating strengths in precisely the same areas of expertise where we might suppose extra-terrestrial intelligence to excel: those related to mathematics, science, and technology.

Although both Kanner and Asperger are credited with the discovery of autism, Asperger's original cases were different from Kanner's in having well developed speech and even "talking like grown-ups" in early childhood. Reflecting this early difference in emphasis, the most recent edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders (DSM IV TR)* distinguishes what is now widely known as *Asperger's syndrome* from classical autism (sometimes called in contrast *Kanner's syndrome*). Asperger's syndrome shares the central deficits in mentalism and the restricted, repetitive patterns of behaviour, interest, and activity seen in classical autism, but is distinguished by the absence of delays or deficits in language and of obvious signs of cognitive impairment in childhood. Consequently, Asperger's syndrome is sometimes described as *high functioning autism*[(94)]. Indeed, a recent study of a population of children aged 7 in South-East England found that only 35 per cent of those affected by autism or Asperger's syndrome had IQs below 70—probably as a result of a greater awareness of autism in brighter children. As Uta Frith comments, "This new finding raises the possibility that learning disability may not be as strongly associated with autism as was once thought"[(95)]. Furthermore, the results of a postal questionnaire distributed to British members of Mensa (an organization for people

[(94)] American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders*. Fourth, Text Revision ed. 2000, Washington, DC: American Psychiatric Association. 943.

[(95)] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

whose IQ falls within the top 2 per cent of the population) found real associations between high intelligence and infantile autism (along with gout and myopia)[96].

Although Asperger's subjects have obvious deficits in many ways and have often been described as clumsy and uncoordinated in their actions, they are often notably better than average at performing spatial tasks, such as doing jigsaw puzzles. Unlike normal children or those with general intellectual impairment, whose performance on different cognitive tests tends to be similar, autistic children often show a more uneven pattern. Perhaps because of their mentalistic deficits, autistic children tend to do worst on subtests that demand a high degree of communicative competence and/or social intelligence, such as comprehension tests, which demand an ability to interpret the often implicit meanings, intentions, and understandings conveyed in a passage of writing. However, autistic children in general, and those diagnosed with Asperger's syndrome in particular, do best—and sometimes better than normal children—at tests of spatial ability, such as the block design test. Indeed, if extraordinary facility with doing things like jigsaw puzzles is included[97], the majority of people with autism would be classed as showing some specific talent[98].

Again, compulsive concentration on a single subject need not always be counterproductive, as an autistic writer observes:

> While most clinicians with expertise in Asperger's syndrome would likely say that dwelling on certain subjects counts as negative, I must disagree. I have the trait of sticking to a project long enough to see it through to completion ... Since I can think about subjects repeatedly for long periods of time without getting bored, my mind has greater access to deeper thinking about those subjects. I find that with repeated tenacious thoughts, things that were initially difficult to figure out do eventually get figured out.[99]

In his original paper on autism, Hans Asperger remarked that,

> To our own amazement, we have seen that autistic individuals, as long as they are intellectually intact, can almost always achieve professional success, usually in highly specialized academic professions, with a preference for abstract content. We found a large number of people whose mathematical ability determines their professions: mathematicians, technologists, industrial chemists, and high ranking civil servants. A good professional attitude involves single-mindedness as well as a decision to give up a large

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[96] Sofaer, J.A. and A.E. Emery, *Genes for super-intelligence?* Journal of Medical Genetics, 1981. **18**(6): p. 410-3.

[97] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[98] Happe, F., *Autism: cognitive deficit or cognitive style?* Trends in Cognitive Sciences, 1999. **3**(6): p. 216-22.

[99] Sanders Jnr., R.S., *Overcoming Asperger's: Personal Experience & Insight*. 2004, Murfreesboro,

> number of other interests. It seems that for success in science or art, a dash of autism is essential. . Indeed we find numerous autistic individuals among distinguished scientists.[100]

Autistic tendencies in general, and Asperger's syndrome in particular, have been suggested as allied with the outstanding skills and even genius in scientists such as Sir Isaac Newton (1643-1727), Albert Einstein (1879-1955), and Paul Dirac (1902-84). Another example is Michael Ventris (1922-56), the cryptographer who deciphered the ancient Mycenaean script known as *Linear B*[101]. Temple Grandin adds Vincent van Gogh (1853-90); Charles Darwin (1809-82), Gregor Mendel (1822-84), and Bill Gates, founder of Microsoft, to the list[102]. Others who have been retrospectively diagnosed as somewhere on the autistic spectrum include the poet, artist, sculptor, and architect Michaelangelo Buonarroti (1475-1564)[103]; the philosopher Ludwig Wittgenstein (1889-1951); and the Indian mathematician, Srinivasa Ramanujan (1887-1920)[104]. Politicians and statesmen too have been added to the list of those suspected of having been Asperger's cases: specifically Thomas Jefferson (17431826)[105], Eamon de Valera (1882-1975), and perhaps most interestingly of all, Adolf Hitler (1889-1945)[106]. However, and as the last name might suggest, it would probably be wrong to assume that all of those with autistic tendencies who achieve fame or notoriety put their talents to the best uses. It has recently been suggested that Theodore J. Kaczynski, otherwise known as the Unabomber, is an Asperger's case. Kaczynski's engineering skills were diverted into bomb-making (astonishingly, often with wooden parts) and his social isolation resulted in a highly atypical career of lone terrorism. If this diagnosis is correct, the fact that the Unabomber occasioned the longest and most expensive manhunt in the twentieth century and was only caught when he attempted to communicate his ideas by publishing his *Unabomber Manifesto* is a indication of what a force for evil as well as good autistic tendencies can be[107].

Recently Michael Fitzgerald published a book about what he terms *Asperger's savants*: that is, "persons with high functioning autism or Asperger's syndrome who pro-

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TN: Armonstrong Valley Publishing Company. 175.

[100] Asperger, H., *'Autistic psychopathy' in childhood*, in *Autism and Asperger syndrome*. 1991, Cambridge University Press: Cambridge. p. 37-92.

[101] Baron-Cohen, S., *The essential difference: Men, women, and the extreme male brain*. 2003, London: Allen Lane.

[102] Grandin, T., *Thinking in Pictures and other reports from my life with autism*. 1995, New York: Vintage Books. 222.

[103] Arshad, M. and M. Fitzgerald, *Did Michaelangelo (1475-1564) have high- functioning autism?* Journal of Medical Biography, 2004. **12**: p. 115-120.

[104] Fitzgerald, M., *Autism and Creativity*. 2004, Hove and New York: Brunner- Routledge. 294.

[105] Ledgin, N., *Diagnosing Jefferson: Evidence of a Condition that Guided His Beliefs, Behavior, and Personal Associations*. 1998, Arlington, Texas: Future Horizons. 254.

[106] Fitzgerald, M., *Autism and Creativity*. 2004, Hove and New York: Brunner- Routledge. 294.

[107] Silva, J.A., M.M. Ferrari, and G.B. Leong, *Asperger's Disorder and the Origins of the Unabomber*.

duce works of genius"[108]. Despite the fact that, as Fitzgerald himself notes, "Persons with Asperger's syndrome are often atheoretical", he includes the philosophers Spinoza (1632-77), Immanuel Kant (1724-1804), and A. J. Ayer mentioned earlier (see above p. xx). Less surprising perhaps is his inclusion of several famous musicians, such as Wolfgang Amadeus Mozart (1756-91), Ludwig van Beethoven (1770-1827), Eric Satie (1866-1925), and Bela Bartok (1881-1945), and along with Van Gogh, the painters L. S. Lowry (1887-1976) and Andy Warhol (192887)[109].

Understandably perhaps in the light of the on-going debate about the exact diagnosis of autism and Asperger's syndrome, not all of these suggestions have been accepted by everyone. In particular, Oliver Sacks has questioned whether Wittgenstein, Einstein, and Newton, were "significantly autistic," contrasting their cases with that of the chemist, Henry Cavendish (1731-1810), who he believes certainly was. Sacks thinks that, unlike most other "supposed autistic geniuses," he showed "near-total incomprehension of common human behaviours, social relationships, states of mind, and money, as well as an almost obsessed attention to detail—which led him to the great generalizations he was later to erect"[110].

But however that may be, the combination of outstanding skill or talent and autistic tendencies is not confined to a few, famous cases. Ten percent of autistics, but only one percent with other developmental deficits, show so-called *savant skills*: in other words, remarkable cognitive and memory ability found among more prevalent disability. Such talents are usually limited to music, art, maths and calendar calculation, mechanical and spatial skills, often featuring astonishing memorization feats; while the combination of blindness, autism and musical genius is unusually frequent[111]. For example, a pair of identical twin savants described by Sacks possessed calendar-calculating skills over an 80,000 year range; could not do simple arithmetic, but would calculate lengthy prime numbers for fun; could instantly count and factorize the number of matches that fell out of a box; and could remember the weather and the important political events on every day of their adult lives while having little or no memory of more personal events[112]. Kim Peek, the inspiration for the film, *Rain Man*, walks with a sideways gait, cannot button his clothes or manage many of the practical chores of daily life, has great difficulty understanding abstraction, and has an overall IQ of 87. Yet he has an encyclopaedic knowledge of history, political leaders, roads and highways in the U.S. and Canada, professional sports, the space program, movies, actors and actresses,

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American Journal of Forensenic Psychiatry, 2003. **24**(2): p. 5-43.

[108] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts.* 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[109] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts.* 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[110] Sacks, O., *Autistic geniuses? We're too ready to pathologize.* Nature, 2004. **429**: p. 241.

[111] Treffert, D.A., *Savant Syndrome: 'Special Faculties' Extraordinaire.* Psychiatry Times, 2001: p. 20-1.

[112] Sacks, O., *An Anthropologist on Mars: Seven Paradoxical Tales.* 1995, London: Picador. 318.

Shakespeare, the Bible, Mormon doctrine and history, calendar calculations, literature, telephone area codes, major Zip codes, television stations, classical music, along with the detailed content of 9000 individual books at the time of writing[113][114].

Such feats are fairly easy to authenticate, but what of the claims sometimes made about musical savants? Blind Tom was purchased as a child at a slave auction in Georgia in 1850 along with his mother. A contemporary described him as "idiotic for any other purpose" and capable of nothing but "gyrations and melodies". He did not speak and could barely walk by the age of five and "gave no other sign of intelligence" apart from an "everlasting thirst for music." But despite having been blind from birth, he taught himself to play the piano by the time he was four, and by the age of 11 he was performing before the president at the White House, and later went on a successful concert tour to Europe. His vocabulary ultimately amounted to less than a hundred words, but although incapable of learning anything else, his musical repertoire eventually included over five thousand pieces, and he was said to be able to perfectly reproduce passages of unfamiliar music up to 15 minutes long[115]. His modern equivalent is Leslie Lemke, also blind from birth and afflicted with cerebral palsy, who now gives regular concerts and reproduces music from memory with such machine-like precision that members of the audience are asked to write down their requests rather than shout them out (because otherwise Lemke will insist on playing each and every one in the order in which he heard them, no matter how long it takes!)[116]. We saw just now that Mozart has been posthumously diagnosed as a so-called Asperger's savant. At the age of 14, he is said to have written out the complete score of Allegri's *Miserere* after a single hearing on a visit to St Peter's in Rome. The *Miserere* is a complex antiphonal piece for multiple choirs culminating in nine parts, and copyright was kept exclusive to the Vatican choir under pain of excommunication. It is easy to imagine that such stories as these may have lost nothing in the telling, and perhaps gained much.

Nevertheless, some properly controlled experiments have been attempted. In one, Hermelin, and O'Connor compared the performance of a 19-year old musical autistic savant who had an IQ of 61 and almost total absence of spontaneous speech with that of an accomplished musician. Both listened to two pieces of recorded music that they had not heard before (Grieg's "Melody", opus 47 no. 3, and part of Bartok's "Mikrokosmos"). The autistic savant gave an almost note-perfect rendering of all 64 bars of "Melody", playing 798 notes of which only 8 per cent were wrong. By contrast, the professional pianist attempted to play only 354 notes, but in this much abbreviated version there

[113] Treffert, D.A., *Extraordinary People: Understanding Savant Syndrome*. Authors Guild Backinprint.com edition ed. 2000, Lincoln NE: iUniverse.com. 396.

[114] Treffert, D.A. and D.D. Christensen, *Inside the Mind of a Savant*, in *Scientific American*. 2005. p. 88-91.

[115] Treffert, D.A., *Extraordinary People: Understanding Savant Syndrome*. Authors Guild Backinprint.com edition ed. 2000, Lincoln NE: iUniverse.com. 396.

[116] Treffert, D.A., *Extraordinary People: Understanding Savant Syndrome*. Authors Guild Backinprint.com edition ed. 2000, Lincoln NE: iUniverse.com. 396.

were a total of 80 per cent wrong notes. Hermelin adds that after 24 hours during which he had not heard the piece again, the savant gave a second near-perfect performance. However, in the case of the less conventional piece by Bartok, the savant again played more notes (277 against 153), but got 63 per cent of them wrong as compared to only 14 per cent in the case of the professional musician. On a separate occasion, Leslie Lemke was asked to reproduce and improvise on the same two pieces and was compared with another professional musician. According to Hermelin's account, "Having first played a few bars of Grieg's 'Melody' note perfect, Leslie produced 215 bars of improvisation, which he played with enormous enthusiasm and verve. The professional pianist played 95 bars..." Then, in a manner reminiscent of Beethoven's famous improvisations (and who, as we have already seen has also been diagnosed an Asperger's savant), she continues, "the savant replaced Grieg's rather thin musical texture with something much more dense and though he never lost sight of the main theme and returned to it often, he interspersed this with extravagant flamboyant expansions. In contrast to Leslie's embellishments of Grieg's spare texture, the professional musician tended to retain it, and his improvisations were simple, reflective and restrained, as indeed is Grieg's own composition." Where the Bartok was concerned, Hermelin recounts that "the two participants resembled each other much more closely than they had done in their improvisations on the piece by Grieg, although for the Bartok, too, Leslie also gave a much richer interpretation, mostly by putting in more chords"[(117)].

These findings give credence to accounts of comparable (if less rigorous) tests carried out on Blind Tom. For example, because he could not read music, the top line of an original 14-page composition was played to him while he was asked to fill in the accompaniment. Having successfully performed this feat, he "proceeded to play the treble with more brilliancy and power than the composer". Indeed, a panel of sixteen outstanding musicians of the day concluded that "in ... every form of musical examination" Blind Tom "showed a capacity ranking him among the most wonderful phenomena in musical history"[(118)]. Clearly then, musical savants do exist, and where an undoubted genius like Mozart is concerned, the story of how the Pope lost his monopoly on Allegri's *Miserere* seems perfectly plausible.

So-called *acquired savant syndrome* can occasionally emerge after brain injury or disease in a previously normal person. For example, a nine-year old, who was deaf-mute and paralysed by a gun-shot wound to the left hemisphere, developed outstanding mechanical skills after the injury. But perhaps the most remarkable case is that of Daniel Tammet. Diagnosed with Asperger's syndrome, Daniel developed an unusual combination of synaesthesia and savantism following a series of childhood epileptic seizures. *Synaesthesia* describes the mixing of senses so that in Daniel's case, for example, every number up to about 10,000 is seen as a uniquely coloured and textured

[(117)] Hermelin, B., *Bright Splinters of the Mind: A personal Story of Research with Autistic Savants.* 2001, London and Philadelphia: Jessica Kingsley Publishers. 188.

[(118)] Treffert, D.A., *Extraordinary People: Understanding Savant Syndrome.* Authors Guild Backinprint.com edition ed. 2000, Lincoln NE: iUniverse.com. 396.

shape, occasionally also associated with a specific emotional feeling. By means of manipulating numbers visualized in this way, Daniel can perform calculations with the speed and accuracy of a computer, and currently holds the British and European record for the rote recitation of the places of pi from memory to 22,514 places—a feat achieved in just over five hours. His synaesthesia also extends to words, and following a challenge from a TV producer, Daniel learnt one of the world's most difficult and distinct languages, Islandic, in one week sufficiently well to be successfully interviewed live in the language on Islandic televison. Indeed, and tellingly illustrating my opening remarks about autistics and aliens, one of the Islanders described Daniel's linguistic skill as "not human"[119].

But acquired savant syndrome need not only be acquired in childhood. On the contrary, fronto-temporal dementia in older people can sometimes release remarkable artistic skills while devastating normal functions[120]. Experimental evidence pointing to the same conclusion comes from a remarkable study in which eleven right-handed male volunteers underwent magnetic stimulation of the left fronto-temporal lobe of their brains before being asked to reproduce images of animals and faces by drawing. The magnetism had the effect of temporarily inhibiting this region, which is the same part of the brain where damage or degeneration is known to be associated with the spontaneous appearance of savant skills in previously normal people. Although some autistic savants excel in pictorial art, the output, be it drawing, painting, sculpture or modelling, is usually realistic, rather than abstract or conceptual[121]. Indeed, this is often how savant's artistic skills are first recognized: even as children they show technical competence in representing things in their art that goes far beyond that normal for their age. The frontal-lobe magnetic-inhibition study found that some subjects showed a dramatic change of style towards a more life-like way of drawing, with more attention to realistic details and less of a tendency to caricature—but only after genuine stimulation, not after control sessions when no magnetism was applied. Indeed, one subject said that after the stimulation he was more "alert" and "conscious of detail," and that the experimenters had "taught him how to draw dogs!"[122].

Another study of five patients all diagnosed with fronto-temporal dementia noted that the creativity of these subjects was visual but never verbal. Similarly, the paintings, photographs, and sculptures were realistic copies lacking an abstract or symbolic content. The painters remembered realistic landscapes, animals or people, and seemed to recall images that were then mentally reconstructed as pictures without the me-

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[119] Tammet, D., *Born on a Blue Day: A Memoir of Asperger's and an Extraordinary Mind.* 2006, London: Hodder & Stroughton. 242.

[120] Miller, L., et al., *Emergence of Artistic Talents in Frontotemporal Dementia'.* Neurology, 1998. **51**(4): p. 978-82.

[121] Hermelin, B., *Bright Splinters of the Mind: A personal Story of Research with Autistic Savants.* 2001, London and Philadelphia: Jessica Kingsley Publishers. 188.

[122] Snyder, A.W., et al., *Savant-like Skills Exposed in Normal People by Suppressing the Left Frontotemporal lobe.* Journal of Integrative Neuroscience, 2003. **2**(2): p. 149-58.

diation of language. Also, despite progressive cognitive and social impairment, they showed increasing interest in the fine detail of faces, objects, shapes, and sounds. The authors of this study also cite the case of a Polish painter who suffered a lefthemisphere stroke associated with aphasia (loss of speech) but lost only the ability to create the highly symbolic pictures that he had previously painted, while retaining an ability to paint realistically without a flaw[123].

Brain-imaging shows left-brain abnormalities in savants along with changes to the *corpus callosum*, the thick bundle of nerve fibres that connects the two hemispheres (indeed, Kim Peek lacks this structure altogether). Language and other mentalistic skills are localized more on the left half of the brain than the right in most people. It is in the left hemisphere that the main speech centres are found, but in children with autism language develops much more on the right side of the brain than it does in normal children[124]. Exactly the same is found in the pattern of activity involving the prefrontal and parietal regions of the brain, which are normally correlated on the left in normal subjects, but on the right in high-functioning autistics[125]. On the other hand, typical savant skills such as artistic, musical, and mechanical abilities are found more on the right side of the brain. Taken together, these observations suggest that savant syndrome may result from compensation in the right hemisphere of the brain for damage in the left. This may go along with lower-level, "habitual" memory compensation for higher-level "cognitive" memory deficits. The 6-fold predominance of savant syndrome in males may be explained by the left hemisphere completing its development later than the right. This might make it more vulnerable to pre-natal influence from the male sex hormone, testosterone, which slows and impairs neuronal function. The result would be enlargement of the right hemisphere, perhaps with a shift towards the right hemisphere skills typical of savants[126]. Musical savantism often features perfect pitch (as it did in the case of Mozart, for example), and here it is worth noting that recent evidence suggests that a particular region of the auditory cortex in the right hemisphere is much more specialized for representing detailed pitch information than its counterpart on the left side of the brain. For example, tones that are close together in pitch seem to be better resolved by neurons on the right.[127]

Each cerebral hemisphere is in the main linked to the opposite side of the body. In other words, the left motor cortex controls the right side of the body, and right cortex the left. People normally show a dominance of one hemisphere over the other. Nine out

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[123] Miller, L., et al., *Emergence of Artistic Talents in Frontotemporal Dementia'.* Neurology, 1998. **51**(4): p. 978-82.

[124] Flagg, E.J., et al., *Language lateralization development in children with autism: insights from the late field magnetoencephalogram.* Neuroscience letters, 2005. **386**(2): p. 82-7.

[125] Koshino, H., et al., *Functional connectivity in an fMRI working memory task in high-functioning autism.* NeuroImage, 2005. **24**(3): p. 810-21.

[126] Treffert, D.A., *Savant Syndrome: 'Special Faculties' Extraordinaire.* Psychiatry Times, 2001: p. 20-1.

[127] Zatorre, R., *Music, the food of neuroscience?* Nature, 2005. **434**: p. 312-15.

of 10 people are right-handed, meaning that the left, verbal, more mentalistic hemisphere is normally dominant, but as the findings above might suggest, lefthandedness is more common in autism and Asperger's syndrome, with 18-20 per cent of sufferers being left-handed.

Women activate more brain regions on difficult verbal tasks than do men, who by contrast to women only activate the right cortex on challenging spatial tasks[128]. At birth, the right hemisphere is normally larger in males, whereas the corpus callosum is larger in females, and its size is linked to verbal intelligence[129]. This may be why brain imaging of a rhyming task showed that men activated only the left hemisphere (specifically, the *inferior frontal gyrus* or *Broca's* area), whereas women activated both left and right sides of the brain. Such differences in laterality between the sexes may also explain why men but not women usually suffer verbal deficits following left hemisphere stroke[130]. Again, women appear to be less lateralized than males: in other words, they show less differences between the two halves of the brain, and consequently a more balanced development than that normally found in males. In autism, by contrast, reduced cortical connections via the corpus callosum have been reported[131]. Compared to males, females are less likely to be left-handed, but lefthanders of either sex are more likely to score high on maths, musical, and drawing ability, and chess. And as the facts about brain laterality would suggest, left-handed people have on average better spatial ability, and are more common in visual arts occupations, and in architecture and engineering.

During gestation, hands develop early, at much the same time as sexual differentiation, and along with the brain and heart. The relative length of the fingers is fixed by 14 weeks, and reflects hormonal influences in the womb. In men, the ring finger or fourth digit tends to be longer than the index finger or second digit, but in women the lengths of these fingers tends to be more similar. A low ratio like that found in men correlates with masculinity, autism, left-handedness and musical ability, while a high ratio correlates with femininity, vulnerability to breast cancer, and high female but low male fertility[132][133][134].

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[128] Gur, R.C., et al., *Sex Difference in Temporo-limbic and Frontal Brain Volumes of Healthy Adults.* Journal of the Cerebral Cortex, 2002. **12**: p. 998.

[129] Davatzikos, C. and S.M. Resmick, *Sex Differences in Anatomic Measures of Interhemispheric Connectivity: Correlations with Cognition in Women but not Men.* Cerebral Cortex, 1998. **8**: p. 634-40.

[130] Shaywitz, B.A. and et al., *Sex differences in the functional organization of the brain for language.* Nature, 1995. **373**: p. 607-9.

[131] Koenig, K., K.D. Tsatsanis, and F.R. Volkmar, *Neurobiology and Genetics of Autism: A Developmental Perspective*, in *T he Development of Autism: Perspectives from Theory and Research*, J.A. Burack, et al., Editors. 2001, Erlbaum: Mahwah, NJ. p. 81-101.

[132] Bennett, R., *Sexual orientation linked to handedness*, in *Science News.* 2000. p. 53.

[133] Motluk, A., *Handy guide: Do a person's fingers reveal their sexual orientation?*, in *New Scientist.* 2000. p. 5.

[134] Williams, T.J., et al., *Finger-length ratios and sexual orientation.* Nature, 2000. **404**: p. 455-6.

This suggests that early developmental influences, ultimately controlled by genes and mediated by hormones, may account for the development of both autism and savant syndrome. For example, a recent study of 29 normal girls and 41 boys carried out at the age of 12 months found that the girls made significantly more eye-contact than the boys and that the amount of eye-contact in both sexes was related to exposure to foetal testosterone—in other words, to the effects of the principal male hormone before birth[135]. In a further study, amniotic fluid, obtained from 87 pregnant women for routine amniocentesis was analysed for foetal testosterone level. Their infants (40 girls and 47 boys) were followed up 18 and 24 months after birth and their vocabulary was assessed. Girls were found to have a significantly larger vocabulary than boys at both ages, and this difference was related to foetal testosterone exposure, suggesting that it might be involved in shaping the neural mechanisms underlying communicative development in the cases of both eye-contact and language ability.[136]. More recently still, the mothers of 35 boys and 23 girls who were followed up to age four completed a questionnaire assessing language, quality of social relationships, and range of interests in their children. Higher exposure to foetal testosterone was found to correlate negatively with quality of social relationships (taking normal sexdifferences into account), and was also positively correlated with restricted interests in boys. In other words, these findings suggest that pre-natal exposure to male sex hormones is associated with poorer quality of social relationships and more restricted interests, particularly in boys[137]. And in adult men of course, testosterone is notoriously associated with increased aggression and irritability and with reduced feelings of empathy and concern for others[138].

From the very beginning, both Kanner and Asperger noticed that what they were each independently describing as autism was much more prevalent in males than in females, and Asperger originally believed that his syndrome never occurred in girls before puberty[139]. Nor were such initial impressions entirely misleading. According to *DSM IV TR* rates of incidence of the disorder are four to five times higher in males than in females and higher still in Asperger's syndrome[140], and according to some estimates, males exceed females by 10 to one or more at the highest functioning end

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[135] Lutchmaya, S., S. Baron-Cohen, and P. Raggatt, *Foetal testosterone and eye contact at 12 months.* Infant Behaviour and Development, 2002. **25**(3): p. 32735.

[136] Lutchmaya, S., S. Baron-Cohen, and P. Raggatt, *Foetal testosterone and vocabulary size in 18- and 24-month-old infants.* Infant Behaviour and Development, 2002. **24**(4): p. 418-24.

[137] Knickmeyer, R., et al., *Foetal testosterone, social relationships, and restricted interests in children.* Journal of Child Psychology and Psychiatry, 2004. **45**: p. 1-13.

[138] Dabbs, J.M. and M.G. Dabbs, *Heroes, Rogues and Lovers: Testosterone and Behavior.* 2000, New York: McGraw-Hill. 285.

[139] Wing, L., *The relationship between Asperger's syndrome and Kanner's autism*, in *Autism and Asperger syndrome*, U. Frith, Editor. 1991, Cambridge University Press: Cambridge. p. 93-121.

[140] American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders.* Fourth, Text Revision ed. 2000, Washington, DC: American Psychiatric Association. 943.

of the autistic spectrum associated with Asperger's syndrome[141][142][143]. Indeed, in his original report Hans Asperger suggested that autism may represent an extreme development of the normal male brain: "The autistic personality is an extreme variant of male intelligence. ... Boys... tend to have a gift for logical ability, abstraction, precise thinking and formulating, and for independent scientific investigation. In the autistic individual, the male pattern is exaggerated to the extreme"[144].

Experiments with babies only a day old show that from birth girls attend more to social stimuli, such as faces and voices, than do boys, who attend more to non-social, spatial stimuli, such as mobiles or traffic[145]. Babies with autism show an even more marked lack of interest in faces, and here it may be significant that autistics process visual information about faces in the same part of the brain normally used for objects alone, rather than in the specialized face-recognition and reaction region found in normal people[146][147]. Normally girls develop social skills sooner than boys, and studies suggest average female superiority in language skills, social judgment, empathy, and co-operation. Most girls develop language earlier than most boys, and higher levels of the male hormone testosterone are generally associated with lower verbal ability[148]. By 18 months there can be a huge difference between boys and girls, with some children still not yet speaking and others with vocabularies of up to six hundred words[149]. Women on average perform better at verbal tasks than do men. For example, they can generally name twice as many synonyms for a word than can the average man, and women can usually generate longer lists of words beginning with the same letter. Furthermore, as one writer points out, "Simple thought and action are consistent with low verbal skill. A larger vocabulary encourages complicated thought, not speedy action. The less time spent considering possibilities, the easier it is to keep a positive frame of mind"[150].

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[141] Gillberg, C., *Maternal age and infantile autism.* Autism and Development Disorders, 1980. **10**: p. 293-297.

[142] Wing, L., *The Autistic Continuum*, in *Aspects of Autism: biological research*, L. Wing, Editor. 1988, Gaskell/Royal College of Psychiatrists: London.

[143] Ehlers, S., et al., *Asperger syndrome, autism, and attention disorders: a comparative study of the cognitive profiles of 120 children.* Journal of Child Psychology and Psychiatry, 1997. **38**: p. 207-218.

[144] Asperger, H., *'Autistic psychopathy' in childhood*, in *Autism and Asperger syndrome.* 1991, Cambridge University Press: Cambridge. p. 37-92.

[145] Baron-Cohen, S. *The Assortative Mating Theory.* Edge 158 2005 [cited 2005 April 6, 2005}; Available from: http://www.edge.org/documents/archive/edge158.html.

[146] Pierce, K., et al., *Face processing occurs outside the fusiform 'face area' in autism: evidence from function MRI.* Brain, 2001. **124**: p. 1337-53.

[147] Schultz, R.T., et al., *Abnormal ventral temporal cortical activity during face discrimination among individuals with autism and Asperger syndrome.* Archives of general psychiatry, 2000. **57**(4): p. 331-40.

[148] van Goozen, S.H.M., et al., *Activating Effects of Androgens on Cognitive Performance: Causal Evidence in a Group of Female-to-Male Transsexuals.* Neuropsychologica, 1995. **32**: p. 1153-57.

[149] Baron-Cohen, S. *The Assortative Mating Theory.* Edge 158 2005 [cited 2005 April 6, 2005}; Available from: http://www.edge.org/documents/archive/edge158.html.

[150] Dabbs, J.M. and M.G. Dabbs, *Heroes, Rogues and Lovers: Testosterone and Behavior.* 2000, New York: McGraw-Hill. 285.

Reduced frontal brain volume is associated with anti-social and psychopathic behaviour, which are much more common in men, and claims have been made that temporal and frontal lobe brain volumes are larger in women[151]. Increased volume in these areas suggests superior abilities where pro-social and self-inhibitory behaviour is concerned, and according to one authority "affords us neurobiological evidence that women may have a better brain capacity than men for actually censoring their aggressive and anger responses"[152]. Indeed, according to a survey of the scientific literature, the single interpretation that best describes the research findings across a wide range of tasks is that women have greater inhibitory abilities than men on most tasks involving sexual, social, and emotional content[153].

Women are also superior to men in perceptual speed as measured, for example in finding matching items; fine-motor co-ordination (such as that involved in needlework); pretend play in childhood; and arithmetic. Male superiority is normally found in mathematical reasoning, especially geometry and logic. Indeed, at the highest level male mathematicians outnumber female 13-to-one. Men also normally excel in embedded and rotated figure tasks[154][155]. Interestingly in this respect, female-tomale transsexuals who receive testosterone injections in preparation for their sexchange operations have been reported to show large increases in rotational ability[156]. One such sexchange patient recorded the following impressions after three months of testosterone treatments:

I have problems expressing myself, I stumble over my words. Your use of language becomes less broad, more direct and concise. Your use of words changes, you become more concrete... I think less; I act faster, without thinking. ... The visual is so strong.when walking in the streets I absorb the things around me. ... It gives a euphoric feeling. I do miss, however, the overall picture. Now I have to do one thing at a time; I used to be able to do different things simultaneously. . I can't make fine hand movements anymore; I let things fall out of my hands. . My fantasy life has diminished strongly. I would have liked to keep that. I am becoming clumsy, more blinkered. I didn't ask for this; it just happens. .[157]

Another recent finding that may have a similar explanation is the fact that women carrying male foetuses improve their performance on difficult cognitive tasks involving

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[151] Gur, R.C., et al., *Sex Difference in Temporo-limbic and Frontal Brain Volumes of Healthy Adults.* Journal of the Cerebral Cortex, 2002. **12**: p. 998.

[152] Cohen, H., *Frontline Comment.* The Scientist, 2002. **16**(20): p. 7.

[153] Bjorklund, D.F. and K.K. Harnishfeger, *The Evolution of Inhibition Mechanisms and Their Role in Human Cognition and Behavior*, in *Interference and Inhibition in Cognition*, F.N. Dempster and C.J. Brainerd, Editors. 1995, Academic Press: New York. p. 141-204.

[154] Kimura, D., *Sex and Cognition.* 2000, Cambridge, MA: MIT Press.

[155] Baron-Cohen, S., *The extreme male brain theory of autism.* Trends in Cognitive Science, 2002. **6**(6): p. 248-254.

[156] van Goozen, S.H.M., et al., *Activating Effects of Androgens on Cognitive Performance: Causal Evidence in a Group of Female-to-Male Transsexuals.* Neuropsychologica, 1995. **32**: p. 1153-57.

[157] Dabbs, J.M. and M.G. Dabbs, *Heroes, Rogues and Lovers: Testosterone and Behavior.* 2000, New

working memory and spatial ability, but not on any other tests. Although the factor responsible could not be determined and is unlikely to have been foetal testosterone, some other similar product of the foetus/placenta is almost certainly the cause[158]. By contrast, *androgen deprivation* is a male sex hormone-reducing therapy sometimes used to treat prostate cancer in men. Subjects given cognitive tests after therapy showed slightly improved verbal fluency but reduced ability to recall images, suggesting that their skills in these respects had been shifted towards the female pole of cognitive ability[159].

Males are generally superior in most (but not all) spatial skills, and in target-directed motor skills, irrespective of practice. Where navigation is concerned, recent experiments found that men travel about 20 per cent further in virtual mazes than women do. Furthermore, women take approximately 30 per cent longer to orientate themselves, and are more likely than the men to be wrong when they do. Out of an equal number of males and females using a virtual maze for real life navigation, only one of 17 subjects who got completely lost was male[160]. One possible explanation is that male and female brains simply do not work the same way in such situations. Brain imaging recently demonstrated that on exiting a virtual 3-D maze women activate the right parietal cortex and right prefrontal cortex, whereas men trigger the left hippocampus alone[161].

In the case of geography, boys always win the National Geography Bee, which tests American children in grades four to eight on their knowledge of places around the world[162], and male college students can locate almost twice as many countries on an unlabelled map of the world as female students can[163]. In general, men—but not boys—seem to navigate preferentially by vector (that is, directions and distances), whereas women—but not girls—normally prefer to use landmarks[164]. The fact that this difference only appears after puberty suggests that it is an evolved, innate one mediated by sex hormones. Furthermore, such evolved sex-differences in cognition would have made sense in our ancestral environment to the extent that vegetarian food of the kind typically collected by women in primal hunter-gatherer societies is indeed often best located by reference to fixed landmarks, whereas game that is being pursued by hunters can take off in any direction, and may well dictate a novel, crosscountry

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York: McGraw-Hill. 285.

[158] Vanston, C.M. and N.V. Watson, *Selective and persistent effect of foetal sex on cognition in pregnant women.* Neuroreport, 2005. **16**(7): p. 779-82.

[159] Salminen, E., *Men's trouble*, in *New Scientist.* 2005. p. 20.

[160] Charles, J., *In a Virtual Maze, Men Are Smart Rats*, in *New York Times.* 2001.

[161] Gron, G., et al., *Brain activation during human navigation: gender-different neural networks as substrate of performance.* Nature Neuroscience, 2000. **3**: p. 404-8.

[162] Liben, L., *Psychology Meets Geography: Exploring the Gender Gap on the National Geography Bee.* Psychological Science Agenda, 1995. **8**: p. 8-9.

[163] Cross, J.A., *Factors Associated with Students' Place Location Knowledge.* Journal of Geography, 1987. **86**: p. 59-63.

[164] Motluk, A., *You're holding the map upside-down*, in *New Scientist.* 2002. p. 21.

return to base, rather than one using well-known paths. Such cross-country navigation demands exactly the kind of spatial sense at which men excel, and studies of women's greater ability to remember the location of objects closer to home also fits the predictions from the hunter-gatherer model[165].

Again, tool-making and missile-throwing ability would certainly have benefited primeval males more than females in most instances, and such skills would probably have been critically involved with males' success in conflicts both with other males and in hunting. According to an experimental archaeologist who has been making stone tools for 37 years, the basic skills needed for making stone tools are mainly visual, spatial, and manual: "Good hand-eye co-ordination, a good sense of geometry, patience and an ability to get the feel of a stone. An appreciation of angles and pressure points is crucial. You have to have to see inside the stone and predict how the stone will behave when you do something to do it"[166]. At the very least, this would explain why mechanical, manual, and throwing skills all seem to be aspects of male cognitive proficiency today—not to mention why they are also found in connection with superior vector-navigating ability and geographical expertise. Certainly, today the average man does better than the average woman on most—but not all—tests of mechanical skill, notwithstanding the fact that women generally appear to be more dextrous than men[167].

Standard psychometric tests—so-called IQ tests—usually exclude any items that show large sex differences simply because they are designed to test populations of both sexes. The result, of course, is that sex differences in cognition are systematically ignored or underestimated by such measures[168]. However, some special aptitude tests are exceptions, and these show a very marked superiority in male performance where mechanical skills are concerned. For example, US Air force aptitude tests for mechanical comprehension show that the average male performance exceeds that of 80 per cent of females[169], and in the top 10 per cent of mechanical reasoning ability males outnumber females by approximately 8-to-1[170]. The relevance of this finding to Asperger's syndrome is that it is sometimes called "the engineer's disorder". Indeed, authorities in the field comment that

it is hard to find a clinical account of autism that does not involve the child being obsessed by some machine or another. Typical examples include extreme fascinations with

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[165] Silverman, I. and M. Eals, *Sex Differences in Spatial Abilities: Evolutionary Theory and Data*, in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, J. Barkow, L. Cosmides, and J. Tooby, Editors. 1992, Oxford University Press: Oxford. p. 533-49.

[166] Bradley, B., *Art of stone*, in *New Scientist*. 2006. p. 54-5.

[167] Dabbs, J.M. and M.G. Dabbs, *Heroes, Rogues and Lovers: Testosterone and Behavior*. 2000, New York: McGraw-Hill. 285.

[168] Kimura, D., *Sex and Cognition*. 2000, Cambridge, MA: MIT Press.

[169] Browne, K.R., *Women at War: An Evolutionary Perspective.* Buffalo Law Review, 2001. **49**(1): p. 51-247.

[170] Browne, K.R., *Evolved sex differences and occupational segregation.* Journal of Organizational Behavior, 2006. **27**: p. 143-162.

electricity pylons, burglar alarms, vacuum cleaners, washing machines, video players, trains, planes and clocks ... Showing an apparently precocious mechanical understanding, whilst being relatively oblivious to their listener's level of interest, suggests that their folk physics might be outstripping their folk psychology in development.[171]

As another author puts it, "children with autism tend to relate to others as though they were machines rather than people"[172].

According to a survey of 919 families of children with autism or Asperger's syndrome which listed occupations of parents, fathers of children with autism or Asperger's were twice as often employed in engineering as were fathers in any of four control groups of children with Tourette's or Down Syndrome. The *Autism-Spectrum Quotient* or *AQ Test* consists of fifty questions covering social skill, attention switching, attention to detail, communication, and imagination. Fifty-eight adults with Asperger's syndrome, 174 randomly selected controls, 840 students at Cambridge University, and the 16 winners of the UK Mathematics Olympiad were each sent a questionnaire by post. Results showed that the majority of people with Asperger's syndrome scored above 32 (out of a maximum of 50). But interestingly, among the students at Cambridge University, those in the sciences and technology had a higher AQ score compared to those in the arts and humanities. Mathematicians scored the highest of all—around 20 out of 50—and were closely followed by engineers, computer scientists, and physicists. Among the scientists, biologists and medics scored the lowest, around 14 out of 50[173].

Another study of a mathematician, a physicist, and a computer scientist all diagnosed with Asperger's tested them against controls on folk physics and folk psychology (Reading Eyes Test). Although all three equalled control subjects' performance on sex judgments on the eye test, all scored more than one standard deviation below controls on folk psychology and more than one standard deviation above on folk physics (which is comparable to 85 per cent of Asperger's subjects, who also score at or above this level). As the researchers comment, "These results strongly suggest that theory of mind (folk psychology) is independent of IQ, executive function and reasoning about the physical world." They conclude, "There thus seems to be a small but statistically significant link between autism and engineering"[174]. Indeed, it is one that can be seen in a sample of Asperger's original cases of "autistic psychopathy". A recent study of these found that in 37 cases where the father's profession was mentioned the most

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[171] Baron-Cohen, S., *Autism: deficits in folk psychology exist alongside superiority in folk physics*, in *Understanding Other Minds*, S. Baron-Cohen, H. Tager-Flusberg, and D.J. Cohen, Editors. 2000, Oxford University Press: Oxford. p. 73-82.

[172] Mitchell, P., *Introduction to Theory of Mind: Children, Autism and Apes*. 1997, London: Arnold. 196.

[173] Baron-Cohen, S. and L. Else, *In a different world*, in *New Scientist*. 2001, 14 April.

[174] Baron-Cohen, S., et al., *A Mathematician, a Physicist and a Computer Scientist with Asperger Syndrome: Performance on Folk Psychology and Folk Physics Tests*. Neurocase, 1999. **5**: p. 475-83.

common form of employment was a technical one and that the most frequently seen profession was "engineer" or "electrical engineer"[175].

With the benefit of hindsight, it may even be possible to disentangle the truth about the notorious "refrigerator mother' (see above pp. xx-xx). Uta Frith points out that

As convincing evidence for the genetic causes of autism has now emerged, a new twist has been added to the story. Kanner's and Asperger's clinical intuitions about the often intellectual and detached parents of the children they saw were not mistaken. Well-controlled studies have shown that fathers as well as mothers may have some of the same traits as their children, often in very mild form. Of course, this does not mean putting back the blame on early interaction with parents. If anyone is to blame, it is indifferent Mother Nature.[176]

An astonishing example of the possibility that both fathers and mothers may contribute to the likelihood that a child will be diagnosed autistic can be found in the reported incidence of these disorders in Silicon Valley (Santa Clara County, California). In 1993 there were 4,911 diagnosed cases of classic autism. In 1999 the figure passed 10,000, and in 2001 there were 15,441 cases, with new ones added at 7 per day, 85 per cent of them children. Given that employment in Silicon Valley is primarily in electronic engineering and computing, and that equal-opportunity employment means that many children born there will have both parents in these industries, so-called *assortative mating* has been suggested as the most likely explanation. This is the idea that likes attract, and that people tend to marry partners who have much in common with themselves. In other words, it looks as if mentalistic deficits in people with engineering skills are being compounded in their children by inheritance of these deficits from both parents[177][178]. Studies to confirm this finding are currently under way, and the first results suggest that mothers of children with autism are indeed more likely to have a more technological turn of mind than normal, along with interests more typical of men[179].

Today there is certainly strong evidence that autism and Asperger's Syndrome run in families. For example, there is a 90 per cent chance an identical twin of a sufferer will also be diagnosed autistic. The risk of a second child being autistic if one is already rises from 1-in-500 to 1-in-20, while the risk for a third being autistic after two children already are diagnosed is 1-in-3. Estimates of heritability of these disorders suggest that up to 90 per cent of the variation in symptoms is due to genetic causes and, as

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[175] Hippler, K. and C. Klicpera, *A retrospective analysis of the clinical case records of 'autistic psychopaths' diagnosed by Hans Asperger and his teaching at the University Children's Hospital, Vienna*, in *Autism: mind and brain*, U. Frith and E. Hill, Editors. 2004, Oxford University Press: Oxford. p. 21-42.

[176] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[177] Silberman, S., *The Geek Syndrome*, in *Wired*. 2001.

[178] Constantino, J.N. and R.D. Todd, *Intergenerational Transmission of Subthreshold Autistic Traits in the General Population.* Biological Psychiatry, 2005. **57**: p. 655-660.

[179] Baron-Cohen, S. *The Assortative Mating Theory.* Edge 158 2005 [cited 2005 April 6, 2005}; Available from: http://www.edge.org/documents/archive/edge158.html.

I mentioned earlier, there is now good evidence that autistic deficits in general are normally distributed throughout the population, with only the more severe incidence being diagnosed as classical autism or Asperger's syndrome[180][181][182].

Nevertheless, Temple Grandin remarks that

Aware adults with autism and their parents are often angry... They ask why nature or God created such horrible conditions as autism. However, if the genes that caused these conditions were eliminated there might be a terrible price to pay. It is possible that persons with bits of these traits are more creative, or possibly even geniuses. If science eliminated these genes, maybe the whole world would be taken over by accountants.[183]

But as we have seen, there is a small but statistically significant link between autism and engineering, and the researchers who discovered it continue:

The current result might also help to explain why a condition like autism persists in the gene pool: the very same genes that lead an individual to have a child with autism can lead to superior functioning in the domain of folk physics. Engineering and related folk physics skills have transformed the way in which our species lives, without question for the better. Indeed, without such skills, Homo sapiens would still be pre-industrial.[184]

Again, the link between autism and engineering may also be a factor explaining the frequently-encountered failings of instruction manuals mentioned in the last chapter. If such instructions are the work of engineers or designers, then their failings where consideration of the difficulties of potential users are concerned may not simply be a result of their authors' expertise in understanding the product but may also lie in engineers' and designers' constitutional short-comings where mental skills such as understanding of others' belief are concerned (see above pp. xx-xx). In the case of one otherwise "very competent computer analyst" who was also autistic, "his inability to

understand *that they could not understand what was wrong* made it almost impossible for him to explain the problems or help people to correct their errors"[185] [author's emphasis].

Temple Grandin confesses that as a child she "was completely turned on by machines instead of people" and that even as an adult who regards herself as partly recovered from autism, she is still "turned on by machines, especially control mechanisms designed

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[180] Constantino, J.N. and R.D. Todd, *Autistic Traits in the General Population: A Twin Study.* Archives of General Psychiatry, 2003. **60**: p. 524-530.

[181] Ashley-Kock, A., et al., *Genetic Studies of Autistic Disorder and Chromosome 7.* Genomics, 1999. **61**: p. 227-236.

[182] Schroer, R.J., *Autism and Maternally Derived Aberrations of Chromosome 15q.* American Jounal of Medical Genetics, 1998. **76**: p. 327-336.

[183] Sacks, O., *An Anthropologist on Mars: Seven Paradoxical Tales.* 1995, London: Picador. 318.

[184] Baron-Cohen, S., et al., *A Mathematician, a Physicist and a Computer Scientist with Asperger Syndrome: Performance on Folk Psychology and Folk Physics Tests.* Neurocase, 1999. **5**: p. 475-83.

[185] Howlin, P., *Autism: Preparing for Adulthood.* 2003, London: Routledge. 293.

to interact with people"[186]. Grandin had a maternal grandfather who she describes as "a brilliant, shy engineer who invented the automatic pilot for airplanes," and is herself a noted and very successful engineer to the extent that she has designed a third of all cattle and pig-handling equipment in the USA. She relates "better to scientists and engineers, who are less motivated by emotion" than other people[187], and explicitly attributes her engineering success to her predominantly visual mode of thinking: "Every design problem I've solved started with my ability to visualize and see the world in pictures. ... I visualize my designs being used in every possible situation, with different sizes and breeds of cattle and weather situations. Doing this enables me to correct mistakes prior to construction"[188].

Drawing on her extensive knowledge of autism and autistics, Temple Grandin speculates that

There may be two kinds of thinking—visual and sequential. Society needs to recognize the value of people who think visually. Misinterpretation of psychological test results could label a brilliant visual thinker as below average intelligence. Einstein was a visual thinker who failed his high school language requirement and relied on visual methods of study.[189]

She adds that "People with autism can develop skills in fields that they can really excel in. I've known people who are engaged in satisfying jobs as varied as elevator repair, bike repair, computer programming, graphic arts, architectural drafting, and laboratory pathology. Most of these jobs use the visualization talents that many people with autism have"[190]. This conclusion is underlined by a recent study which compared autistics with normal subjects on tests of comprehension that involved sentences which demanded both verbal and visualization skills such as *The number eight when rotated 90 degrees looks like a pair of eye-glasses.* As the researchers point out, in sentences like this the linguistic content must be processed to determine what is to be imagined, and then the mental image must be evaluated and related to the verbal meaning. Normal subjects only used mental visualization when necessary, but autistic subjects were found to use it even when it was not, and the researchers quote Temple Grandin to the effect they were probably "thinking in pictures" much of the time. Indeed, the study suggested that as a result autistics might be better at visualizing linguistic information than normal people are[191]. And we saw above that at least one autistic savant uses

[186] Grandin, T. and M.M. Scariano, *Emergence: Labelled Autistic.* 1996, New York: Warner Books. 180.

[187] Grandin, T. and M.M. Scariano, *Emergence: Labelled Autistic.* 1996, New York: Warner Books. 180.

[188] Grandin, T., *Thinking in Pictures and other reports from my life with autism.* 1995, New York: Vintage Books. 222.

[189] Grandin, T. and M.M. Scariano, *Emergence: Labelled Autistic.* 1996, New York: Warner Books. 180.

[190] Grandin, T. and M.M. Scariano, *Emergence: Labelled Autistic.* 1996, New York: Warner Books. 180.

[191] Kana, R.K., et al., *Sentence comprehension in autism: thinking in pictures with decreased func-*

his remarkable synaesthetic ability to visualize numbers to perform calculations which would normally require a computer.

As I mentioned at the beginning of this chapter, it is certainly true that children with autism often perform above average for their mental age on embedded-figure or block-design tests which require the child to find hidden elements within a larger picture in the first case or to assemble a figure from parts represented on separate blocks in the second. However, prior segmentation of the parts of the block-design puzzle massively improves the performance of non-autistic children, whether normal or learning-disabled. Nevertheless, it has little effect on the performance of able children with autism, who are extremely fast even with un-segmented designs[192]. Brain-imaging reveals that autistics solve embedded-figure tasks using regions involved in object perception, whereas in normal controls the approach is more global and involves the use of working memory much more[193].

One way of explaining such findings is to propose that autistics show greater *fieldindependence* defined as a lack of influence of context in both visual perception and in social interaction. So for example, breaking up the blocks in the block design test just mentioned could be seen as making the parts more independent of any context, and therefore easier for normal children to re-assemble correctly. However, because autistic children are much more field-independent to the extent that they are much less affected by any existing arrangement of the blocks, the finding that prior segmentation has little effect on them is explained. Indeed, it is possible that "Fielddependent people are easily swayed by others' opinion and tend to take on the prevailing views of their group; field-independent people are unaffected by current crazes and don't care so much about other people's opinion. People with a high degree of social detachment tend to be good at spotting embedded figures"[194].

Such field-dependence has also been called *central coherence*, and Uta Frith points out that *strong* and *weak central coherence* map closely onto the terms *field dependence* and *independence*[195]. An example is provided by the Ebbinghaus illusion (figure 2.1). In reality, both black circles are exactly the same size, but they seem different because of the size contrast of the surrounding figures. Francesca Happe found that autistics are less prone to this illusion, presumably because their greater field-independence makes them go from specific to general and consequently be less likely to be fooled by the surrounding circles. According to a model proposed by Happe, central coherence/field-dependence (or the lack of it) can be found in visual, verbal, auditory and other domains, and varies from strong to weak in the normal population, with the

tional connectivity. Brain, 2006. **129**: p. 2484-93.

[192] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[193] Koenig, K., K.D. Tsatsanis, and F.R. Volkmar, *Neurobiology and Genetics of Autism: A Developmental Perspective*, in *T he Development of Autism: Perspectives from Theory and Research*, J.A. Burack, et al., Editors. 2001, Erlbaum: Mahwah, NJ. p. 81-101.

[194] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[195] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

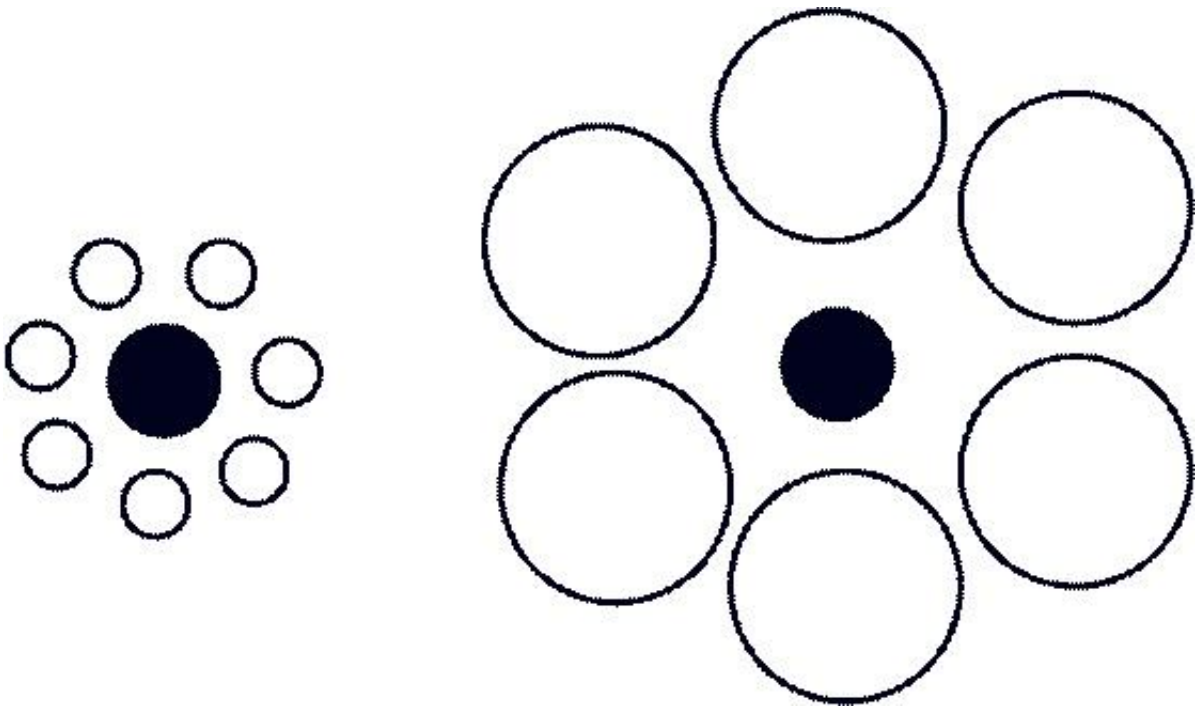

Figure 2.1: The Ebbinghaus illusion

autistics showing a similar range, but biased towards the less centrally-coherent/more field-independent extreme. She also suggests that normal mentalizing relies on field-dependence and in particular on the ability to place things in their context and relate them to their proper background. Children who score high on field-independence in cognitive tests also score low on social competence: for example, in 1,276 three-to-five year olds, those who were more field-independent showed more non-social play. Happe concludes that "individuals with weak central coherence and detail-focused processing are less successful in putting together the information necessary for sensitive social inference"[196][197].

Central coherence is certainly critical where normal understanding of speech is concerned because words owe their meaning to the way in which they are embedded within larger units such as phrases, sentences, or longer units of discourse. Again, field-dependence is particularly clearly seen in the way in which a listener discriminates words which have the same sound but different meanings by means of their verbal context, such as *there*, *their*, or *they're*. But autistics will typically read sentences such

[196] Happe, F., *Autism: cognitive deficit or cognitive style?* Trends in Cognitive Sciences, 1999. **3**(6): p. 216-22.

[197] Happe, F., *Social and non-social development in Autism: Where are the links?*, in *The Development of Autism: Perspectives from Theory and Research*, J.A. Burack, et al., Editors. 2001, Erlbaum: Mahwah, NJ. p. 237-53.

as: "He took a bow from his violin case" with exactly the same pronunciation of *bow* as in "He took a bow and everybody clapped'; or will speak of "a big *tear* in her dress" in exactly the same way as if it were a "big *tear* in her eye"[198].

According to a recent view, the male brain is predominantly hard-wired for understanding and predicting the behaviour of events and objects by building *systems*. *Systemising* is defined as the drive to analyse and explore a system, to extract underlying rules that govern the behaviour of a system; and to construct systems. The systemiser intuitively figures out how things work, or what the underlying rules controlling a system are. Systems can be as varied as a pond, a vehicle, a plant, a library catalogue, a musical composition, a cricket ball or even an army unit. They all operate on inputs and deliver outputs, using "if-then" correlation rules[199].

As in the case of terms like *theory of mind*, *folk psychology* or *empathising*, I have no wish to deny the use of *systemising* as a characterization of extreme male/autistic cognitive style to those who prefer it. But, as in the case of those terms where I would favour *mentalism* for the reasons set out earlier, I would also like to suggest a corresponding alternative to "systemising". And again like the case of mentalism, it would be useful to have a noun, rather than a verb or phrase, and one, furthermore that contrasted appropriately with it to denote male rather than female, and a non-mentalistic style of thought. My suggestion is *mechanistic cognition*[200][201]. As we have already seen, there is a clear link between autism and engineering, and to my way of thinking *mechanistic thinking* describes most of the examples produced to justify it much more aptly than does *systemising*[202].

Another virtue of *mechanistic* as a term for autistic thinking is that it is already current. People with rich experience of autistics comment that "Individuals with autism assign not an everyday but a more mechanistic significance to things"[203]. Certainly, the notorious insistence on punctilious repetition and regular routine by autistics of all kinds might be called "systematic", but *mechanistic* catches its mechanical, mindless character better in my view. The same is true of the rigidly repetitive way that autistics

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[198] Snowling, M. and U. Frith, *Comprehension of 'hyperlexic' readers.* Journal of Experimental Child Psychology, 1986. **42**: p. 392-415.

[199] Baron-Cohen, S., *The essential difference: Men, women, and the extreme male brain.* 2003, London: Allen Lane.

[200] Badcock, C.R., *Mentalism and Mechanism: the twin modes of human cognition*, in *Evolutionary Psychology, Public Policy and Personal Decisions*, C. Crawford and C. Salmon, Editors. 2004, Lawrence Erlbaum Associates: Mahwah, NJ. p. 99-116.

[201] Badcock, C.R. *Mentalism and Mechanism: the twin modes of human cognition.* [HTML document/PDF] 2002; Pre-publication of Chapter 5 in *Human Nature and Social Values: Implications of Evolutionary Psychology for Public Policy* edited by Charles Crawford & Catherine Salmon (Erlbaum, 2004), pp.99-116.:[Available from: http://www.thegreatdebate.org.uk/MentalismCB.html.

[202] Baron-Cohen, S., *The essential difference: Men, women, and the extreme male brain.* 2003, London: Allen Lane.

[203] Vermeulen, P., *Autistic Thinking - This is the Title.* 2001, London and Philadelphia: Jessica Kingsley Publishers. 159.

often carry out instructions without any apparent thought about their meaning: of course this is systematic, but *mechanistic* is a much more apt term, and certainly explains the mechanical, robotic quality that is often attributed to such behaviour by others. Furthermore, *mechanistic* rather than *systemising* ability underlies many of the features listed earlier in which men normally excel, such as mechanical and target-directed motor skills. The mechanistic expertise of the former is self-evident, but accurate throwing-ability also demands an intuitive grasp of Newtonian mechanics (for example in realizing that a projectile follows a curving rather than a straight trajectory but does so more accurately if it is spinning around an axis directed at its target). Again, giving directions using landmarks as women tend to do can be just as *systematic* as using vectors, which men typically prefer. Where vector directions differ is that, like the path of projectiles, they combine direction and distance in a dynamic description which is essentially the same as that used in classical mechanics. If autism spectrum disorders are indeed extremes of normal male rather than female cognitive expertise, then describing them as mechanistic rather than systematic seems justified on these grounds alone—quite apart from the fact that many people with autistic tendencies do indeed have notable mechanical skills of various kinds, as we saw Temple Grandin observing earlier. Indeed, she herself exemplifies the point when she reveals that she became one of the first girls in her school "to be allowed to take wood-shop"—at least until she was forced "to return to the traditional cooking class" and become "a failure once again"[(204)].

A further advantage of the term *mechanistic* as a characterization of the cognitive style of autism is that it avoids the implied contradiction between *systemising* and the weak central coherence found in autistics. In other words, if you describe something as "systematic" you imply that it is coherently consistent and does not have parts that are discrepant with or independent of the whole—that would obviously be *un*systematic. However, describing something as *mechanistic* does not carry the same implications. On the contrary, a mechanistic approach to human behaviour or medicine for example is often described as "reductionist" because of the way in which it sees human phenomena as caused by lower-order processes such as genes or physiological mechanisms. To this extent, you could see the mechanistic approach as more concrete, and less conceptual. This certainly is the view of Temple Grandin, who characterizes autistic cognition as *hyper-specific* and claims that "autistic people don't see their ideas of things, they see the actual things themselves. We see the details that make up the world, while normal people blur all those details together into their general concept of the world." Indeed, she complains that "The problem with normal people is they're too cerebral," or what she calls *"abstractified".* Grandin is emphatic that "When ... an autistic person is seeing the real world instead of his idea of the world that means he's seeing detail.

[(204)] Grandin, T. and M.M. Scariano, *Emergence: Labelled Autistic.* 1996, New York: Warner Books. 180.

... Visual thinkers of any species, animal or human, are detail-oriented[205] [author's emphasis]. Finally, *mechanistic* seems a more apt term than *systematic* to describe the greater representational realism—not to mention proof-reading skills—described earlier in cases of experimentally- or stroke-induced frontal lobe inhibition.

Such devil-in-the-detail reductionism is often contrasted with a so-called *holistic* approach, which focuses instead on the overall configuration (or *gestalt*), and takes a top-down view which inevitably emphasizes central coherence. Furthermore, the holistic outlook is often much more conceptual or abstract because by definition it takes a much wider, more inclusive and field-dependent view (compare the difference between what you think of when you consider *an English person* as opposed to *English people*: the former is likely to be an actual person, the latter has to be much more of an abstract concept). *Holism*, in other words, sees the whole as an entity greater than the sum of the parts, whereas *reductionism* takes a bottom-up view which sees the parts as completely constituting the whole and therefore tends to ignore the larger, field-dependent perspective. In his apt and amusing book on autistic thinking, Peter Vermeulen points out that "the first axiom in systems theory" is "that the whole is more than the sum of its parts ... Systems theory regards the world in terms of the mutual relatedness and dependency of phenomena. The characteristics of a system, an integrated whole, cannot be reduced to its constituent parts." By contrast, he adds that "individuals with autism live in a multi-universe: a world of unaccountable, incoherent details that are experienced as having only one meaning: the literal meaning. The world of people with autism is more like a world of different bits and pieces"[206]. At its worst, this leads to a highly disintegrated and chaotic view of life that is anything but holistic or systematic in its cognitive quality. Speaking of one particular autistic young woman, someone who knew her well described her as follows:

Kate knows and understands a great deal but seems to have very limited ability to structure. To use her way of putting things, her life is a heap of odd-shaped stones. Anything she tries to construct soon falls down, whereas other people build amazing structures, which often seem impenetrable and meaningless walls to her, hemming her in on every side. The more structured a subject, the less it means to her... (Hermelin 2001 p. 50)

Controlled scientific studies of autistic savants certainly suggest that their cognitive style is mechanistic, rather than systematic—and is anything but holistic. Consider the autistic savant with a measured verbal IQ of only 89 but a vocabulary score equivalent to an IQ of 121 who can understand, talk, read, write and translate from Danish, Dutch, Finnish, French, German, Greek, Hindi, Italian, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, Turkish and Welsh. However, he translates word by word like "an automaton", with no concern for the meaning of whole sentences.

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[205] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. 2005, New York: Scribner. 357.

[206] Vermeulen, P., *Autistic Thinking - This is the Title*. 2001, London and Philadelphia: Jessica Kingsley Publishers. 159.

When asked to take his time and look at the whole sentence first, he became distressed and said that he could not do it (Hermelin 2001 p. 71).You could call this "systematic", but *mechanistic* seems a much better description. Indeed, this is precisely the way in which computer translation tends to turn out: fine for translating individual words, but weak on rendering the sense of the whole. Contrast this with the method used by Sigmund Freud (1856-1939) when translating: "Instead of laboriously transcribing from the foreign language, idioms and all, he would read a passage, close the book, and consider how a German writer would have clothed the same thoughts— a method not very common among translators"[207]. Perhaps not, but as a method of translation it was just as systematic as the one above in its own way, but was distinctly less mechanistic and much more holistic—not to say *mentalistic*.

Astonishingly, evidence of a strikingly mechanistic tendency can sometimes also be found in artistic savants—perhaps the last place you expect to find it, and particularly in connection with painting and drawing. Nevertheless, writing about Andy Warhol (who we saw earlier he considers to be an Asperger's savant), Michael Fitzgerald observes that "One reason for Warhol's success may have been that he represented the machine age. Romanticism was meaningless to him; the machine age was everything." He goes on to quote Warhol remarking, "The things I want to show you are mechanical," adding, "I would like to be a machine, wouldn't you?". Fitzgerald concludes that Wahrol "had the autistic mechanical mind", and quotes other authorities who point out that Warhol "loved all sorts of machines and gadgets, embracing new techniques and technologies, working with tape recorders, cassettes, Polaroid, Thermofax, but the heart of all this experimentation had at its central focus photography and silkscreen for making a painting." They add that "This was by extension his love for the machine because the screen process was very machinelike"[208]. Describing L.S. Lowry, who was another Asperger's savant in his view, Fitzgerald comments that this "chronicler of industrial reality," who looked on other humans as comical automatons, "habitually avoided any conversation that hinted at inner meaning in art, or one that looked as if it might lead to such conclusions." Indeed, he was not above teasing his own friends in this respect, "in order to deflate pomposity or pretension"[209].

In the experiment described earlier in which normal volunteers' frontal lobes were inhibited by magnetic means, the same subjects who had shown the most notable change in their drawing style also showed the greatest improvement in a proofreading test. Proof-reading requires close attention to detail—the kind of bottom-up, word-by-word mechanistic approach seen in the linguistic savant described just now. But here again the improvement in proof-reading skill was only found after actual stimulation of the subjects' frontal lobes, not after the placebo. As the experimenters comment,

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[207] Jones, E., *The Life and Work of Sigmund Freud*. Vol. 1. 1953, New York: Basic Books.

[208] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[209] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

"These proof-reading results provide non-subjective evidence of the ability to switch on savant-like skill by turning off part of the brain in healthy individuals"[210].

Earlier, I pointed out in passing that Leslie Lemke, the modern Blind Tom, reproduced a piece by Bartok much less impressively than he had one by Grieg, which he got almost note-perfect by comparison with the Bartok, which he got 80 per cent wrong (and much worse than a professional musician control who got the Bartok 76 per cent correct). An explanation may lie in the fact that such modern music is much less formally structured—and certainly much less predictable—than music of the classical or baroque periods, which could almost be described as much more *mechanistic* by comparison. Another autistic with a musical talent complained that even though some of his favourite music was from the Romantic era, he felt lost in a sea of non-harmonic tones and was unable to impose an analytic structure upon the music. He added that "The resultant muddiness in the demarcation of the structural borders along with the increased use of tones that are not part of a given chord make it more difficult for me to separate the foreground from the background in order to determine the harmony"[211]. At the very least, this suggests that, not only in memory and language skills, but in music also, autistic savants may be relying on a machine-like, field-independent, weakly centrally-coherent thinking ability to achieve their distinctive results.

Summarizing these and many other findings relating to autistic savants of different kinds, Beate Hermelin concludes that "Savant ability appears to take a route leading from the detail to the whole, thereby reversing our dominant tendency of information processing"[212]. Temple Grandin calls this *specific-to-general* thinking, and comments:

Looking at a lot of specific details and then piecing them together is how people with Asperger's think. All my thinking goes from specific details to forming a general principle. I have learned from interviewing many people that most go from general concept to specifics. Their thinking is "top down" and my thinking is "bottom up."[213]

According to another autistic author, autistics have a kind of brain that "zeroes in rather than zeroes out. It is ... a purer way of thinking that has advantages"[214].

Weak central coherence, field-independence, and a specific-to-general cognitive style certainly seem to fit nicely with the recently proposed *under-connectivity theory* of autism. Functional magnetic resonance imaging of the brains of 17 autistics with normal IQ was compared with that of 17 non-autistic control subjects. The study showed

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[210] Snyder, A.W., et al., *Savant-like Skills Exposed in Normal People by Suppressing the Left Frontotemporal lobe.* Journal of Integrative Neuroscience, 2003. **2**(2): p. 149-58.

[211] Shore, S., *Beyond the Wall: Personal Experiences with Autism and Asperger Syndrome.* 2001, Shawnee Mission, Kansas: Autism Asperger Publishing Co. 174.

[212] Hermelin, B., *Bright Splinters of the Mind: A personal Story of Research with Autistic Savants.* 2001, London and Philadelphia: Jessica Kingsley Publishers. 188.

[213] Grandin, T., *Comments*, in *Diagnosing Jefferson: Evidence of a Condition that Guided HIs Beliefs, Behavior, and Personal Associations*, N. Ledgin, Editor. 1998, Future Horizons: Arlington, Texas. p. 197-207.

[214] O'Neill, J.L., *Through the Eyes of Aliens: A Book About Autistic People.* 1999, London: Jessica Kingsley. 144.

that in both groups language functions were carried out by the same network of brain areas, but that in the autistic brains the network was less synchronized, and *Broca's area* (which serves an integrating function in language ability) was much less active. However, *Wernicke's area*, the other important speech centre that concentrates more on the processing of individual words, was more active in the autistic brains (perhaps explaining the word-by-word translation method of the autistic language savant mentioned above). Again, the sentence-visualization study I mentioned earlier which suggested that autistics do indeed think in pictures also supported the conclusion that this comes about in part thanks to reduced connectivity within the brain. These findings suggest that the neural basis of disordered language in autism entails a lower degree of information integration and synchronization across the large- scale cortical network for language processing—just as weak central coherence or a liking for specific-to-general thought processing would predict. Indeed, such a lack of integration within the brain might explain why some people with autism have normal or even superior skills in some areas, while many other types of thinking are disordered. It could be that the brain adapts to the diminished inter-area communication in autism by developing more independent, free-standing abilities in each brain centre. This might sometimes translate into the superior but isolated abilities typical of autistic savants[215][216].

Although there is also good evidence of denser connections than normal at a local level, another recent study points out that "Physically in the autistic brain, high local connectivity may develop in tandem with low long-range connectivity"[217], much as it does to a lesser degree in the normal male[218]. Certainly, the remarkable synaesthetic savantism of Daniel Tammet described earlier in this chapter would fit this suggestion (despite being a very unusual condition). This is because synaesthesia in general has been seen as a result of overlapping and cross-talk between neighbouring brain areas—a theory which also seems to explain foot-fetishism (because the foot neighbours the genitals in the cortex)[219][220]! But however that may be, it is certainly possible that communication between different centres within the brains of autistics retards processing in much the same way that a large number of users logged onto a computer network tend to slow it down. Certainly, excesses in local connections along with deficits in overall brain integration might explain why autistics sometimes show

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[215] Kana, R.K., et al., *Sentence comprehension in autism: thinking in pictures with decreased functional connectivity.* Brain, 2006. **129**: p. 2484-93.

[216] Just, M.A., et al., *Cortical activation and synchronization during sentence comprehension in high-functioning autism: evidence of underconnectivity.* Brain, 2004. **127**(8): p. 1811-1821.

[217] Baron-Cohen, S. and M.K. Belmonte, *Autism: A Window Onto the Development of the Social and the Analytic Brain.* Annual Review of Neuroscience, 2005. **28**: p. 109-26.

[218] Baron-Cohen, S., R.C. Knickmeyer, and M.K. Belmonte, *Sex Differences in the Brain: Implications for Explaining Autism.* Science, 2005. **310**: p. 819-23.

[219] Ramachandran, V.S. and D. Rogers-Ramachandran, *Synaesthesia in phantom limbs induced with mirrors.* Proceedings of the Royal Society of London, B, 1996. **263**: p. 377-86.

[220] Mattingley, J., et al., *Unconscious priming eliminates automatic binding of colour and alphanumeric from in synaesthesia.* Nature, 2001. **410**: p. 580-3.

faster processing in certain cognitive functions but not others. An example might be so-called *inspection time.* This is the interval taken to correctly identify a visual stimulus, and has been found to correlate with IQ scores. People with higher intelligence seem on average to be more efficient in processing visual information when it is presented only briefly: "They can accurately tell what has been shown to them when others only see a blur"[221].

However, this is not true of autistics. On the contrary, autistic children with average IQ of 83 have been found to have the same minimum inspection time as normal controls with average IQ of 118 (about 40 milliseconds). Indeed, autistic children with IQ of 68 had inspection time of only 42 milliseconds compared to 60 milliseconds for non-autistic but learning-disabled controls with IQ of 62. In other words, "This study proves that basic information-processing capacity is not necessarily reduced in autism"[222] citing[223]. If the information-processing involved in fast inspection time was bottom-up and local rather than top-down and global, it would certainly accord with the view that low-level processing in autistic brains might be enhanced, while overall connectivity might nevertheless be impoverished.

Such findings certainly tally with the fact that, unlike those of normal children, autistics' scores on the many different sub-tests that are summed to produce an intelligence quotient are often highly uneven. Autistics appear to perform worst on tasks demanding holistic mental skills, such as tests of verbal comprehension or commonsense social reasoning. However, as we have already seen, they perform best on tasks demanding discriminatory spatial skills such as block-design, Seguin Formboard and Raven's matrices tests. "All these tests aim to be independent of shared cultural knowledge, and they are all likely to tap basic processing efficiency independent of mentalizing ability"[224]. Indeed, where autistic savants are concerned, we have already seen that there can be staggering differences between their performance in their area of expertise and their overall IQ, which is usually well below normal.

Comparable findings to these studies of autistics have been reported when the subtest scores of children diagnosed with Williams and Down syndromes have been compared. *Williams syndrome* has been linked to the deletion of at least 16—and possibly up to 30—genes on chromosome 7, whereas *Down syndrome* is caused by having an extra copy of chromosome 21. Sufferers from both syndromes have IQs of about 50, but Down children do better than Williams on measures of spatial IQ, and Williams do better than Down—indeed, often as well as the average person—on measures of verbal IQ[225].

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[221] Deary, I.J., *Intelligence: A Very Short Introduction*. 2001, Oxford: Oxford University Press. 132.

[222] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[223] Scheuffgen, K., et al., *High 'intelligence,' low 'IQ'? Speed of processing and measured IQ in children with autism.* Developmental Psychopathology, 2000. **12**: p. 83-90.

[224] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[225] Bellugi, U., et al., *Neuro-psychological, neurological, and neuroanatomical profile of Williams Syndrome.* American Journal of Medical Genetics Supplement, 1991. **6**: p. 115-125.

The contrasting findings from Down and Williams syndromes suggest that the fundamental reason for such remarkable unevenness in performance on sub-tests of different kinds may ultimately hinge on the fact that they relate to two distinctly different kinds of cognition: what I am distinguishing as mentalistic and mechanistic. If two different cognitive systems, rather than one unified one, underlie what IQ tests attempt to measure, then such findings are entirely to be expected, and indeed are significant precisely because they reveal the divided foundations on which intelligence may be based. A distinction between conventional IQ and social or emotional intelligence has already been suggested[226][227], but the true distinction may be one of mentalistic as opposed to mechanistic intelligence. However, it is also one that is likely to have been obscured by the tendency which I mentioned earlier to exclude tests that discriminate between the sexes from measures of standard IQ.

Because women averagely do better on mentalistic skills and men generally better on mechanistic ones, exclusion of measures revealing such sex differences also effectively rules out tests highlighting these two forms of intelligence, perhaps partly explaining why they have tended to escape notice until now.

[226] Marlowe, H.A., Jr., *Social intelligence: Evidence for multidimensionality and construct independence.* Journal of Educational Psychology, 1986. **78**: p. 52-58.

[227] Salovey, P. and J.D. Mayer, *Emotional intelligence.* Imagination, Cognition and Personality, 1990. **9**: p. 557-568.

3. Attention, Intention, Memory, and Mental Agency

From an evolutionary point of view, a plausible origin for what I am calling mentalism might be found in *direction of gaze*[228]. Primates (which include monkeys, apes and human beings) are typified by forward-rotated eyes, often to the extent that the visual axes are practically parallel (as in the human case). The benefit of this is excellent stereoscopic vision, which would have served their ancestors well in the arboreal habitat in which primates first evolved. However, the cost is a notable reduction in the visual field, particularly when compared with the almost panoramic view enjoyed by many mammals whose eyes are placed much more to the side of the head and whose visual fields may only overlap to a limited extent at the front. Indeed, prey animals like horses, cattle, and sheep have a small blind spot directly in front of them as well as one behind their heads[229]. When crossing a road for example, children have to be taught to look both ways, but most mammals would see both ways in such a situation without much need of head movements, thanks to their eyes being placed on the sides, rather than at the front, of the head. The result is that primates have become more social (and more vocal) so as to gain the advantage of many different pairs of eyes. Primates have also compensated for their restricted field of view by becoming sensitive to the direction of gaze of others. This is particularly important because, not only can it tell you where the others in the group are looking, it can also give useful clues about what they are seeing, their state of mind, and intentions.[230]

In other primates the outer surface of the eye is often the same colour as the rest of the face. In birds such as terns the whole eye is effectively camouflaged by being the same colour as the surrounding plumage (in the case of the tern, a black cap reaching down just far enough to hide the eyes). However, human beings have a white area— the *sclera*—surrounding the iris which may have evolved to reveal direction of gaze by giving the eyes a target-like appearance with their black pupils surrounded by a coloured iris surrounded in turn by the white sclera. Indeed, a recent series of experiments suggest that, along with the sclera we have evolved a dedicated expert

[228] Emery, N.J., *The eyes have it: the neuroethology, function and evolution of social gaze.* Neuroscience and Biobehavioral Reviews, 2000. **24**: p. 581-604.

[229] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. 2005, New York: Scribner. 357.

[230] Allman, J., *Evolving Brains*. 1999, New York: Scientific American Library. 224.

brain system for monitoring direction of gaze using the whites of the eyes as the principal clues[231].

Today a striking analogy for this evolutionary development exists in military technology. Radars function somewhat like eyes, and like them can be directed. Rules of engagement in some recent conflicts have allowed pilots to interpret a lock-on to their aircraft by an enemy radar as hostile, and to react immediately rather than wait for the missile-launch or gun-attack that might be expected to follow. Certainly, a precedent for this particular analogy can be found in recent brain-scanning experiments in which only the white of the eye was presented as a stimulus. These experiments showed that the more white of eye that was visible in fearful expressions, the greater was the response of the *amygdalas*. These almond-like organs lie deep within what has been called the *emotional brain*[232] and are implicated in fear responses, and as these experiments show, respond particularly to the eyes[233]. Indeed, a recent study of a woman with damage to the amygdalas which impaired her ability to detect fear on other people's faces found that when instructed to look at the other person's eyes, her recognition of fear became normal. Such findings suggest that normal people pay particular attention to the eyes when looking at others' faces, and especially to detect a basic warning signal like fear[234].

The primate researcher, Daniel Povinelli points out that "Appreciating the idea that others 'see' is, in some sense, foundational to the entire question of theory of mind— at least with respect to our human understanding of the mind". He adds that "most of our social interactions begin with determination of the attentional state of our communicative partners, and from that point forward we constantly monitor their attentional focus throughout the interaction. Nothing can disrupt a social interaction more quickly than realizing that someone is no longer looking at you"[235]. Indeed, eyes are often called "the windows of the soul", and detection of another person's direction of gaze and shifts of attention have been described as "the linchpin of social cognition"[236]. It has been proposed that young children first experience the "meeting of minds" which epitomizes mentalism when they shift their attention to join that of someone else as

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[231] Ricciardelli, P., *Look at me! Studies of gaze perception and joint attention*, in *Insitute of Cognitive Neuroscience Research Seminar*. 2001: Centre for Brain and Cognitive Development, School of Psychology, Birkbeck College.

[232] LeDoux, J., *The Emotional Brain: The Mysterious Underpinnings of Emotional Life*. 1996, New York: Simon & Schuster. 384.

[233] Whalen, P.J., et al., *Human Amygdala Responsivity to Masked Fearful Eye Whites.* Science, 2004. **306**: p. 2061.

[234] Adolphs, R., et al., *A mechanism for impaired fear recognition after amygdala damage.* Nature, 2005. **433**: p. 68-72.

[235] Povinelli, D.J., *Folk Physics for Apes: The Chimpanzee's Theory of How the World Works*. 2000, Oxford: Oxford University Press. 391.

[236] Langdon, R., et al., *Attentional orienting triggered by gaze in schizophrenia.* Neuropsychologia, 2006. **44**: p. 417-429.

indicated by the other person's direction of gaze[237]. In other words, where the eyes lead, the mind follows, and what might at first have seemed an after-effect of social living, or a trivial detail in it—direction of gaze—now begins to take on the appearance of a central, fundamental, and strategic adaptation.

From the beginning it has been clear that autistics are notably lacking in awareness of direction of gaze, and are poor at interpreting its psychological significance. In his original paper on autism, for example, Asperger observed that "The characteristic peculiarities of eye gaze are never absent" in autistics. He went on, "From the first moment when an infant can properly 'look', that is, from the third month of life, and well before there is any verbal expression, the majority of his social relations are based on eye gaze. How the small child drinks in the world with his eyes!" But with autistic children,

there is a fundamental difference. Hardly ever does their glance fix brightly on a particular object or person as a sign of lively attention and contact. ... The disturbance is particularly clear when they are in conversation with others. Glance does not meet glance as it does when unity of conversational contact is established. When we talk to someone we do not only "answer" with words, but we "answer" with our look. A large part of social relationship is conducted through eye gaze, but such relationships are of no interest to the autistic child. Therefore, the child does not generally bother to look at the person who is speaking. The gaze goes past the other person or, at most, touches them incidentally in passing.[238]

Temple Grandin observes that the eyes of autistic children "seem to see everything except the one who is speaking to them"[239], and recent research has wholly corroborated Asperger's original finding:

Researchers have also realized that eye gaze can reveal children's thoughts. Experiments have shown that normal children automatically gaze at the right place while being told a story along the lines of the Sally-Anne test. This is not the case with autistic children. Eye gaze turns out to be a better measure of mentalizing ability than the standard verbal response, and is even more discriminating between autistic and non-autistic mentally handicapped children.[240]

In short, if there is indeed a mental module or expert system specialized for gaze-monitoring, it appears to be defective in the case of autistics.

Another deficit found in autism is an inability to judge and interpret others' intentions towards oneself: so-called *intentionality detection*. Autistic people often fail to pick up cues directed at them in otherwise obvious and unmistakable ways, and

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[237] Baron-Cohen, S., *Mindblindness: An Essay on Autism and Theory of Mind*. Learning, Development and Conceptual Change, ed. L. Gleitman, et al. 1995, Cambridge, Mass.: MIT Press. 171.

[238] Asperger, H., *'Autistic psychopathy' in childhood*, in *Autism and Asperger syndrome*. 1991, Cambridge University Press: Cambridge. p. 37-92.

[239] Grandin, T. and M.M. Scariano, *Emergence: Labelled Autistic*. 1996, New York: Warner Books. 180.

[240] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

are poor at interpreting body-language or judging the implications of others' statements and behaviour. Indeed, autistic children notably make pronoun-reversal errors, referring to themselves as "you" and their mothers as "I" or "me'. However, language-impaired controls, such as sufferers from Down syndrome, do not make comparable errors, despite their poor speech competence[241]. Although autistic children are not confused about their own or others' physical identity, and almost always use proper names correctly, they continue to use them long after non-autistic children of the same age have started to employ personal pronouns competently. Even normal adults can make errors with verbs like *let/rent,* or *infer/imply* in which the correct form depends on the relative status of the subjects to the objects concerned. Hence a speaker *implies* something which a listener *infers*, or a landlord *lets* accommodation which a tenant *rents*. In each case, the verb properly used defines who does what relative to whom. Again, whether you use the verb *coming* or *going* often depends from whose point of view you are describing the action: I may say I am *going*, but you may ask if I am *coming*. In such situations, whose point of view is considered is a matter of interpretation, and a common complaint is that a person may fail to see things appropriately from the other person's angle. But people with autism have difficulty with the finer points of such negotiations of social roles and relative points of view. Indeed, all failures on their part which rely on these interpretive skills—including misuse of personal pronouns—have been described as failures in mentalizing[242].

Many other deficits in autistics' language and conversation skills have a similar origin. In large part, this is because human beings normally do not use language completely literally, and expect communications to be relevant to the speaker, their state of mind, knowledge, and beliefs—including, as we have seen, false ones (see above pp. xx-xx). Consequently autistic people tend to use language more literally than normal, and to misinterpret meanings which rely on understanding an expression relative to another person's intention or point of view. For example, a young autistic woman is said to have actually painted the flowers at an art class rather than make a painting of them, and another became alarmed when told that she would be "sleeping on the train" rather than *in a bed inside the train*. Again, a young man with autism and a reputation for taking things said to him literally spent all day travelling to deliver a letter he had been asked to post to a friend. As Patricia Howlin remarks, "This literal response to language can also make individuals sound abrupt or even rude at times. A student called Eric, when asked what year his birthday was by his new tutor, looked at her in incomprehension and replied with scorn, 'Well, every year of course!'"[243].

Again, families with autistic children who have been taught to answer the telephone report that the child will reply to the inquiry of a caller, "Is so-and-so in?" with a simple

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[241] Baron-Cohen, S., *Are Autistic Children "Behaviourists"? An Examination of Their Mental-Physical and Appearance-Reality Distinctions.* Journal of Autism and Developmental Disorders, 1989. **19**(4): p. 579-600.

[242] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

[243] Howlin, P., *Autism: Preparing for Adulthood*. 2003, London: Routledge. 293.

"Yes!" but then replace the receiver, evidently thinking that a correct factual response is all that is required in such a situation[244]! Another common example is provided in this reminiscence from an autistic's autobiography: "During the third grade I remember a classmate telling me that he felt like a pizza. I couldn't figure out what made him feel like a pizza. Eventually I realized he meant that he felt like eating a pizza"[245]. Indeed, all failures to understand or respond to others' feelings and expressions, verbal or otherwise, are failures to correctly interpret intention—at least if we assume that the basic intention of any expressive communication is to be correctly understood. To this extent, mentalistic deficits in autistics' language and conversations skills could be seen as symptomatic of a fundamental shortcoming where interpretation of intention is concerned. Furthermore, if a plausible evolutionary origin of what I am terming mentalism might be found in direction of gaze, which we have seen is also deficient in autism, then detection, prediction, and interpretation of intention are an obvious second stage in the further development of mentalism.

As we have seen, direction of gaze normally reveals the current state of an organism's attention: in other words, it reveals its probable current awareness. Furthermore, this can betray more than merely the direction in which it is looking, or even the exact target of its concern. Direction of gaze can also disclose much about an organism's state of mind. A fixed, unblinking stare at an object can reveal a high level of concern, such as when a predator is stalking prey, or prey being stalked have seen the predator and are apprehensively monitoring it. By contrast, an unfocused, drifting direction of gaze which wanders over a large area can indicate a relaxed, unconcerned frame of mind, for example on the part of prey who have not yet spotted a predator or predators who are not looking for prey. Yet again, a probing, restless scanning of an area can reveal that the organism is searching for something in a state of anxiety or anticipation, as when prey know that a predator is near by but can't tell exactly where it is, or when a predator has temporarily lost its prey but knows it to be in the immediate vicinity.

Such examples as these show what a short step it is to go from monitoring an organism's *attention* to beginning to detect and even predict its *intention*: in other words, extrapolating from its current awareness to its next likely action. Furthermore, these examples also suggest the likely evolutionary forces that might have been at work in bringing about such a development. A prey animal that correctly anticipated the next move of a predator, for example in predicting where and when the predator would pounce, could easily owe its life to that ability. Such a development is an obvious candidate for so-called *arms-race evolutionary escalation:* a situation in which better prediction of predators' intentions on the part of prey leads to predators having to become more resourceful in outwitting such anticipation, which leads to prey having to become even better at predicting intention, and so on, in principle *ad infinitum*—

[244] Houston, R. and U. Frith, *Autism in History: The Case of Hugh Blair of Borgue.* 2000, Oxford: Blackwell. 207.

[245] Shore, S., *Beyond the Wall: Personal Experiences with Autism and Asperger Syndrome.* 2001, Shawnee Mission, Kansas: Autism Asperger Publishing Co. 174.

and in practice until both sides have become very good at monitoring and detecting the other's intentions.

In human behaviour, an ability to correctly monitor others' intentions is also sometimes a matter of life and death, particularly in modern towns and cities where traffic and pedestrians come into close contact. However, we are so habituated to reliably detecting and interpreting others' intentions in the street that we seldom realize that just one or two steps often separate pedestrians and vehicles from potentially lethal encounters with each other. For example, people walking along a street parallel with the traffic may be no further away from it than a person wishing to cross, but it is the latter to whom drivers pay particular attention, usually on the evidence of no more than the person's direction of gaze, posture, and general demeanour. In particular, drivers need to be able to distinguish between someone who is patiently waiting for a chance to cross safely, and someone who is in a hurry, and intent on getting across no matter what. Almost always their ability to make such distinctions will rely on their skill in interpreting intention and reading the signals that reveal it, and sometimes failure will result in severe injury or even death.

Recently brain-scanning has suggested that in order to predict others' behaviour we probably put ourselves in their shoes and unconsciously run through the same processes in our own minds as they do in theirs. So-called *mirror neurones* are known to be excited in parts of the cortex involved with the action when someone sees someone else performing an act, and shortfalls in corresponding areas might explain some mentalistic deficits in autism [Chenga, 2006 #1988]. A sub-circuit known as the *ventral pre-motor cortex* appears to be involved with predicting others' behaviour, while another area called the *dorsal pre-motor cortex* plans the actual execution of it. Some of the brain regions involved in prediction have been found to be abnormal in the brains of people with autism, suggesting where autistics' difficulties with understanding others' intentions and predicting their behaviour may be found[(246)]. Indeed, there is evidence that not only are autistic children poor at detecting, interpreting, and predicting the intentions of others, but that they also fail to conceptualise their own intentions as such[(247)].

For example, in one study, three autistic young men with normal IQ who could pass tests of false belief (such as the Sally-Anne scenario) but nevertheless had varying degrees of mentalistic impairment were asked to record their thoughts at particular but unpredictable moments during a normal day (cued by a special device they carried with them). Each enjoyed participating, but only the least impaired boy quickly took to the idea of reporting his inner mental states; the second least impaired was only able to do so after four sessions; and the most impaired never satisfied the experimenters' criteria for understanding the instructions. Instead, this individual persisted in only recording

[(246)] Ramani, N. and R.C. Miall, *A system in the human brain for predicting the actions of others.* nature neuroscience, 2004. **7**(1): p. 85-90.

[(247)] Frith, U. and F. Happe, *Theory of mind and self-consciousness: What is it like to be autistic?* Mind and Language, 1999. **14**: p. 23-32.

his purely physical actions, never his inner mental state. What struck the authors of this study about the boys' reports was that all three described inner experience which was literal and visual, and appeared to lack verbal or other imagery. There was little or nothing in the way of introspective commentary on the events described which reflected the subjects' own reactions. Such findings appear to be in line with other studies which suggest that when children are able to report their own mental states they are also able to report the psychological states of others, but that when they cannot report and understand the mental states of others, they do not report those states in themselves[248]. In the words of another authority,

"It is impossible to build up a sense of oneself without a good theory of other people's minds"[249].

Other writers observe that "Autobiographies of individuals with autism hint at disturbances of self-consciousness. Just as sleep-walkers can carry out many complex actions without being fully conscious of carrying them out, so children with autism go about their daily routines without full awareness of their own feelings and thoughts"[250]. Indeed, the following excerpt from a published autobiography of an autistic explicitly uses the symbolism of sleep-walking:

Autism had been there before I'd ever known a want of my own, so that my first "wants" were copies of those seen in others (a lot of which came from TV). Autism had been there before I'd learned how to use my own muscles, so that every facial expression or pose was a cartoon reflection identification... Like someone sleepwalking or sleep-talking, I imitated the sounds and movements of others—an involuntary compulsive impressionist.[251] quoting[252]

According to another account,

Whenever I get a very strong emotion and I am not clear as to where it comes from, I have to consider whether someone I am in communication with is displaying a similar emotion, and I am picking it up from them. Sometimes I feel as if I am fused with that other person's emotions and can't separate myself from them. One time when I was talking to my mother on the phone while at college, I got an overwhelming feeling of blackness when I talked to her and became very sad. Thinking about this, I realized that I didn't have anything to be terribly sad about and perhaps had fused myself with

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[248] Frith, U. and F. Happe, *Theory of mind and self-consciousness: What is it like to be autistic?* Mind and Language, 1999. **14**: p. 23-32.

[249] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[250] Houston, R. and U. Frith, *Autism in History: The Case of Hugh Blair of Borgue*. 2000, Oxford: Blackwell. 207.

[251] Frith, U. and F. Happe, *Theory of mind and self-consciousness: What is it like to be autistic?* Mind and Language, 1999. **14**: p. 23-32.

[252] Williams, D., *Somebody Somewhere*. 1994, London: Jessica Kingsley Publishers.

an emotion from her. I called my mother back and found out that she was terribly sad.[253]

The following quotation from an autistic poet whose verbal IQ could not be established because she couldn't understand the questions necessary to determine it, gives eloquent expression to the sense of autistic alienation :

I lost the me

It got under everything That was not poems[254]

A study of so-called Asperger savants mentioned in the last chapter (see above pp. xx- xx) observes that even so well-known and famous a writer as Hans Christian Andersen operated through a false self and had very little of a real or core self. The poet, William Butler Yeats, who has also been diagnosed as an Asperger savant, remarked that "My character is so little myself that all my life it has thwarted me. It has affected my poems, my true self, no more than the character of a dancer affects the movements of a dance"[255]. In the case of other famous people with autistic spectrum disorders, Fitzgerald observes that sometimes their sense of self depends on the admiration of others. The philosopher A. J. Ayer, for example, who Fitzgerald also cites as an Asperger's savant, once remarked (parodying Descartes), "I am famous, therefore I must exist." Ayer also asked whether he even had an image of himself, and answered that he did not think that he had an image of himself in the sense that he was much concerned with his own character[256].

According to the autobiography of a woman diagnosed with Asperger's syndrome at the age of 42, "One of the best ways of understanding what autism is like is to imagine yourself as a perpetual onlooker. Much of the time life is like a video, a moving film I can observe but cannot reach. The world passes in front of me shielded by glass"[257]. Temple Grandin comments that "Using my visualization ability, I observe myself from a distance. I call this my little scientist in the corner, as if I'm a little bird watching my own behaviour from up high." She adds that this has also been reported by other people with autism and that Asperger noted that autistic children constantly observe themselves[258].

The mother of two autistic boys reports that both her sons showed "an indifference or aversion to photographs or films of themselves." Of the one called George she recounts

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[253] Shore, S., *Beyond the Wall: Personal Experiences with Autism and Asperger Syndrome*. 2001, Shawnee Mission, Kansas: Autism Asperger Publishing Co. 174.

[254] Hermelin, B., *Bright Splinters of the Mind: A personal Story of Research with Autistic Savants*. 2001, London and Philadelphia: Jessica Kingsley Publishers. 188.

[255] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[256] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[257] Lawson, W., *Life Behind Glass: A Personal Account of Autism Spectrum Disorder*. 1998, London: Jessica Kingsley Publishers. 118.

[258] Grandin, T. and M.M. Scariano, *Emergence: Labelled Autistic*. 1996, New York: Warner Books. 180.

that he "used to narrate the story of his own life as it was happening always in the third person." Examples are: "He jumped into the bath with a tremendous splash; 'Where can Daddy be?' exclaimed George anxiously." "He clutched his spoon tightly. The sausage bounced off the plate, but he caught it." The mother adds that her all-time favourite was when he was eating a McDonald's hamburger. "He pulled out the slimy, khaki slice of dill pickle and handed it to me, saying, 'Mum, this is my conscience'"[259].

Another autistic's autobiography gives an account of being bullied and beaten by another child to the extent that she discovered on returning home that her face "was criss-crossed and bleeding from thousands of little scratches." Her reaction, though, was "to stand in front of the mirror for a long time looking at my face" which she "thought ... looked interesting." The same writer adds that "The vague sense of my body that I did have meant that I wasn't particularly aware whether I was dirty, or how my clothes were sitting. I didn't feel it."[260]

An additional manifestation of a lack of awareness of their own intentions often seen in autistics is the ease with which others can influence their behaviour in certain respects. Furthermore—and again underlining a possible lack of sense of selfinvolvement in their own behaviour—such external influence can make autistics behave selflessly and co-operatively with others for both good or ill. A case illustrating good might be an autistic who even as an adult would carry groceries for his mother, assist in housework and cooking but "couldn't ask a question, tell a joke, or respond except by repeating a few words of her last phrase." Nevertheless, one of the few sentences he could produce on his own was "I'm being good!"[261].

Autistics are not infrequently the victims of others' mischievous suggestions when it comes to inappropriate, reckless, or deviant behaviour—in part perhaps because they lack the understanding of the conventional norms which would prevent another person agreeing to carry out the act. But a diminished sense of self-responsibility might be another important factor. Patricia Howlin observes that in mainstream schools it is not uncommon for children with autism to be deliberately led into trouble by other children who take a delight in exploiting this vulnerability. As the child with autism is frequently unable to appreciate the difference between children laughing with them and at them, they can be easily led into all sorts of outrageous behaviours[262]. A fascinating historical case of autism, that of Hugh Blair of Borgue (1708/965), shows that things were no different in the past: "Hugh was biddable by anyone including servants and schoolboys. He was often the source of crude amusement for others who provoked him into bad behaviour"[263]. For example, as contemporary witnesses quaintly put it, he

[259] Moore, C., *George and Sam*. 2004, London: Viking. 252.

[260] Frith, U. and F. Happe, *Theory of mind and self-consciousness: What is it like to be autistic?* Mind and Language, 1999. **14**: p. 23-32.

[261] Houston, R. and U. Frith, *Autism in History: The Case of Hugh Blair of Borgue*. 2000, Oxford: Blackwell. 207.

[262] Howlin, P., *Autism: Preparing for Adulthood*. 2003, London: Routledge. 293.

[263] Houston, R. and U. Frith, *Autism in History: The Case of Hugh Blair of Borgue*. 2000, Oxford:

"let even young boys [at school] lead him about and command him to do whatever they did ... the boys for their diversion passing and repassing him and taking off their bonnets ... by way of mock salutation . and he returning these salutations by taking off his hat to them"[264].

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Another important aspect of mentalism is memory. Without memory, people hardly have minds—or at least, have seriously diminished ones, as the tragic plight of those suffering the effects of progressive amnesia due to senile dementia or Alzheimer's Disease shows. Indeed, we would scarcely have any kind of personal mental identity at all if we lacked an ability to recall our own past. And without an ability to remember others, we could hardly have much understanding of other people's minds and would certainly not be able to form any sustained impression of them. Above all, appreciation of false belief—the litmus test of mentalism—is only possible if we can recollect the former state of knowledge that a later one replaces: to put it another way, you can only pass a Sally-Anne test as long as you can recall Sally, and what she did or did not know before Anne's intervention (see above: pp. xx-xx).

Tulving suggested that there are a number of different ways of remembering, each with its own characteristic state of conscious awareness[265]. In so-called *semantic* memory there is generalized, impersonal knowledge about something. Examples might be knowing that Paris is the capital of France; knowing that there are 5280 feet in a mile, or that Columbus discovered America. However, so-called *episodic* memory refers to recollection of individual events which occurred in a person's lifetime. Examples might be recalling a particular visit to Paris that you made, remembering giving the correct answer to how many feet there were in a mile when some particular person asked you, or recalling a specific book you read about Columbus's discovery of America. Essentially the difference is that between *knowing* and *remembering*[266].

According to a further elaboration of the concept suggested by Conway, a fundamental function of human memory is "to retain knowledge of the progress of personal goals." Here episodic memory is seen as a system that contains recent experiences related to the self which are then consolidated into long-term *autobiographical memory*. Access to episodic memories rapidly degrades and most are lost within 24 hours of formation. Only those episodic memories integrated at the time or consolidated later—possibly during sleep—remain accessible and then become true autobiographical memories: "Autobiographical memory is, then, a type of memory that persists over weeks, months, years, decades and lifetimes, and it contains knowledge (of the self) at

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Blackwell. 207.

[264] Houston, R. and U. Frith, *Autism in History: The Case of Hugh Blair of Borgue*. 2000, Oxford: Blackwell. 207.

[265] Tulving, E., *Memory and Consciousness*. Canadian Psychologist, 1985. **26**: p. 1-12.

[266] Baddeley, A., *The concept of episodic memory*, in *Episodic Memory: New Directions in Research*, A. Baddeley, J.P. Aggleton, and M.A. Conway, Editors. 2002, Oxford University Press: Oxford. p. 1-10.

different levels of abstraction"[267]. Particular autobiographical memories are "dynamic transitory mental constructions generated from an underlying multilevel knowledge base which is under control of the 'working' self'"[268]. Indeed,

It seems then that autobiographical memory is dominated by the 'force' or 'demand' of coherence. A stable, integrated, self with a confirmatory past that yields a consistent and rich life story (...) constitutes a self that is able to operate effectively, achieve goals, and relate to others in productive ways (...). A coherent self will have high self-esteem and a strong positive sense of well being (.), both powerful predictors of physical health. Thus, the benefits of coherence may then be considerable.[269]

Semantic, factual memory needs to correspond to reality, so Conway concludes that memory as a whole may be something of a trade-off between the separate but competing demands of coherence with a person's self-image demanded by autobiographical memory and correspondence with reality demanded by the recall of semantic memories[270].

We have already encountered *coherence* in connection with the weak central coherence that is characteristic of the autistic style of thinking (see above pp. xx-xx), and another way of interpreting Conway's remarks just quoted would be to say that episodic/autobiographical memory could be seen as inherently *mentalistic,* while semantic, factual memory was much more *mechanistic.* We have already seen that despite seeming to have an excellent memory after his discovery, Kaspar Hauser appeared to lack any kind of episodic memory from before that event (see above pp. xx-xx), and in laboratory tests individuals from the higher-functioning end of the autism spectrum show characteristic deficits in episodic/ autobiographical memory— those involving personal identification with the event. However, they show no such deficits in relation to semantic memory as tested in tasks such as rote memory, cued recall, and recognition memory[271]. In another study, although Asperger's subjects were described as making significantly fewer *remember* responses (that is, episodic recollections) than did matched normal control subjects, they made more *know* responses (semantic recollections). Furthermore, we have already seen that remarkable rote memory can often be found in autism, and almost always in autistic savants, some of whom have amazing powers of recollection in connection with things like sports, history, or literature

[267] Conway, M.A., *Sensory-perceptual episodic memory and its context: autobiographical memory*, in *Episodic Memory: New Directions in Research*, A. Baddeley, J.P. Aggleton, and M.A. Conway, Editors. 2002, Oxford University Press: Oxford. p. 53-70.

[268] Conway, M.A. *How Psychoanalytic Ideas Can Help Us Understand Human Memory.* in *British Association for the Advancement of Science Festival of Science.* 2003. University of Salford.

[269] Gardiner, J.M., *Episodic memory and autonoetic consciousness: a first-person approach*, in *Episodic Memory: New Directions in Research*, A. Baddeley, J.P. Aggleton, and M.A. Conway, Editors. 2002, Oxford University Press: Oxford. p. 11-30.

[270] Anderson, M., C. and C. Green, *Suppressing unwanted memories by executive control.* Nature, 2001. **410**: p. 366-9.

[271] Bowler, D.M. *Self-awareness and memory in adults with autism.* in *Cognitive Sciences Seminars, University College, London.* 2003.

(see above pp. xx-xx). Yet despite such feats of semantic memory, "the main conclusion is that there is indeed episodic memory impairment in adults with Asperger's syndrome"[272].

Other writers describe autistics as being unable to remember *themselves* performing actions, participating in events or possessing knowledge and strategies, suggesting that the same is true of autistics' autobiographical memory (Powell and Jordan, 1993 quoted by[273]. Indeed, with Conway's perceptive comment quoted just now in mind, you could see this as yet another aspect of weak central coherence in autism: a mentalistic deficit in which autobiographical memory was much less coherent with the self than normal. Finally, a sense of your own central place in your own history allows not only mental time-travel into the past, but into the future too. If you can recall yourself as the principal actor in what has already happened to you, you can also easily imagine yourself as the author of actions yet to take place, and rehearse scenarios of as-yet-unrecorded autobiographical events. But just as we might predict, autistics also show characteristic deficits here: not only are they unlikely to travel mentally into their own past, they are if anything even less likely to travel into the future in this respect[274].

These findings underline the point that episodic/autobiographical memory depends critically on a further aspect of mentalism that we have not discussed so far: what we might term the concept of *agency*. This is described by *The Shorter Oxford English Dictionary* as "the faculty of an agent, or of acting" and as "action personified". Clearly, monitoring gaze, attention, intention, and interpreting motive in others all hinge on seeing others as independent actors, or agents, in interaction. But attributing independent agency or the ability to act to others implies that it is also possessed by the self, which is then seen as an internal agent, responsible for conscious behaviour. Normal episodic/autobiographical memory is characterized by this sense of mental agency: the recognition of your own role in your own remembered past. However, the ability to travel mentally into the future adds another important dimension to the sense of personal agency: that of free will and sovereign, self-determining consciousness.

To see how this comes about and how such a thing is related to mentalism, consider a simple scenario: that of a fugitive and his pursuers. Furthermore, we make the reasonable assumption that the pursuers have limited resources and cannot cover all possible sites for apprehending the fugitive, and that the fugitive can only be in one place at a time. The fugitive, by definition, is a free agent—indeed, he is determined to remain free. But the question is: how free? And in what sense is he a free agent?

In principle, the fugitive may seem completely free, but suppose the pursuers know that the fugitive is likely to resort to location A with the highest probability (his home,

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[272] Gardiner, J.M., *Episodic memory and autonoetic consciousness: a first-person approach*, in *Episodic Memory: New Directions in Research*, A. Baddeley, J.P. Aggleton, and M.A. Conway, Editors. 2002, Oxford University Press: Oxford. p. 11-30.

[273] Suddendorf, T. and M.C. Corballis, *Mental Time Travel and the Evolution of the Human Mind.* Genetic, Social, and General Psychology Monographs, 1997. **123**(2): p. 133-67.

[274] Suddendorf, T. and M.C. Corballis, *Mental Time Travel and the Evolution of the Human Mind.*

say), B with less probability (his family perhaps), or C with less likelihood still (for example, acquaintances), and so on, with decreasing probability for each subsequent suspected place of refuge. If the fugitive thinks for a moment, he immediately realizes that the pursuers will think this. In other words, he becomes *conscious* of what they might do, and in practice exercises normal mind-reading skills—something an autistic would not do at all, or only do with difficulty. What this means is that the fugitive instantly sees that, wherever he goes, he is *not* free to visit A, almost certainly not B, and probably not C either. However, knowing that his pursuers cannot cover all possible sites at one time, he might decide to go to some very improbable ones, say X, Y, or Z. But there again, he might reflect that, if he is sure his pursuers will foresee that he might think this, he might consider A, B, or C after all on the premise that, since he is expected to go there first, they will not look for him there if they anticipate his reaction to their reaction. Nevertheless, the fugitive cannot rule out his pursuers foreseeing this in its turn and therefore continuing to search for him at A, B, and C—which once again suggests somewhere like X, Y or Z...

Clearly, our fugitive is not a completely free agent, but is constrained by his pursuers—at least if he wishes to retain his freedom! The pursuers are certainly free to search for him wherever they wish, but they are also constrained by their expectations of where he might go. But neither has any more than very uncertain knowledge about the other, and knows that what each does in response to the other is constrained by what each thinks the other knows, and thinks the other knows about what they know, and so on, potentially *ad infinitum*. . .

Scenarios like this illustrate the fact that "freedom" is a relative, mentalistic term, meaning different things in different contexts: the fugitive by definition is "free" because he is no longer a captive, and also "free" to decide where to hide. Nevertheless, his freedom is constrained by his desire to stay free, and is to that extent determined by his situation. Moreover, what the fugitive is free to do is further limited by his consciousness of the situation: what he thinks his pursuers think—and by what he thinks they think that he thinks, and so on. This is essentially a Sally-Anne situation, one in which the fugitive and the pursuers' actions are constrained by their beliefs about the other's beliefs.

Of course, such fugitive-and-pursuer situations are the stock in trade of folk-lore, fiction, and mythology the world over, and one reason why they are so perennially popular may be that they so accurately portray the reality of mental interaction. This is because what I as a conscious mental agent can determine about others' intentions and future actions is constrained, not only by what I think they know, but by what they might think I know about what they know, giving rise to considerations regarding what I know about what they know about what I know, and so on. The extra layers of complexity which taking into account others' reactions to your own mental state introduces makes the prediction of others' behaviour so difficult and so contingent

Genetic, Social, and General Psychology Monographs, 1997. **123**(2): p. 133-67.

that regarding them as mental agents with conscious free will is in practice unavoidable and in principle a welcome simplification. In short, if you cannot reliably predict another person's behaviour because the causes are so complex, you might just as well regard it as unpredictable! But at the same time, you cannot simply consider others' behaviour as random and meaningless, because this would be to ignore their mental states altogether and result in you behaving like an autistic in this respect. Instead, you have to both respect others as mental agents in their own right, and also allow them the freedom to act in ways which you can seldom completely control and often not completely predict or perhaps even understand. The result is that mentally you have to accord others conscious free will and respect them as independent agents of their own destiny. Our belief in human freedom is essentially a conclusion forced on us by the necessity of seeing other people's behaviour as essentially unpredictable, but nevertheless motivated. And the role of the other person's mental awareness of others in contributing to their behaviour confirms us in our justified view that we ourselves are conscious mental agents, able to choose an outcome knowingly, even if ultimately unpredictably. Indeed, this is why autistics often seem alien, childish, or robotic in their behaviour: thanks to their symptomatic deficits in mentalism, autistics do not take other's reactions to their own behaviour sufficiently into account, and as a result their behaviour seems crass, unthinking, or compulsive to normal people.

To illustrate the contrast between mentalistic and mechanistic cognition in relation to the issue of agency, consider a surgeon operating on a patient. The surgeon treats the patient as an unconscious, material object on which the surgery is performed, rather as a mechanic might approach a piece of machinery that needed fixing—in other words, *mechanistically*. (Here autistic tendencies would not matter, indeed, to the extent that they helped the surgeon be detached and objective in operating on a patient, they might actually be beneficial.) But in a clinical interview, the same surgeon would treat the same patient as a conscious, self-determining subject, for example in negotiating a drug regime or program of post-operative care. In such contexts as this, the surgeon is obliged to respect the patient's real freedom to choose, for example in agreeing or not agreeing to take medication or exercise in circumstances where, unlike the situation on the operating table, the surgeon does not have the power to enforce compliance on an unfeeling object. In this circumstance, the patient is being treated *mentalistically* (and in such circumstances of persuasion mentalistic skills would definitely pay off, while autistic tendencies would be a serious handicap.) Clearly, both the mechanistic approach to surgery and the mentalistic one to the clinical interview are appropriate and correct, and no one would criticize a surgeon for either. On the contrary, a surgeon who insisted that the patient should be conscious and freely choose for themselves each and every procedure during surgery would probably have as few patients as one who treated patients in interviews as if they were inert, unconscious bodies on an operating table!

It is important to realize that the differences here go much further than merely the context or setting of the interaction: they apply to the basic logic of causality. Suppose

that during the operation the surgeon administers a drug to the patient which does not have the expected effect. The surgeon will have to consider what physiological, chemical, or other physical processes might account for it, and this would involve normal mechanistic, cause-and-effect thinking of the kind epitomized in medical science. But now imagine that in a clinical interview the patient refuses to take a drug which the surgeon wishes to prescribe, perhaps because of a fear of its possible sideeffects. The surgeon is now dealing with a quite different universe of cause-and- effect—the mental one—in which an event like taking or not taking a drug can be motivated by entirely psychological factors, such as beliefs, fears, or knowledge. Such factors may be considered causal, but the principles that govern them are completely different from those of the physical or even biological world. As a result, an entirely different system of cognition is required to understand and manipulate the world of mental reality, in a word: *mentalism*.

However, the fugitive/pursuer or surgeon/patient scenarios are notably one-sided to the extent that the pursuers or surgeon are the dominant agents and the fugitive or patient very much at the receiving end, so to speak. As such they fail to take into account the fact that in normal social interactions a person can play both an active as well as a passive role in relation to someone else, and can hope to have as much influence on the other's behaviour as the other might hope to have on them. Certainly, where interpretation of intention is concerned, mentalism becomes a rich and powerful discourse because of the way in which it so readily takes on elements of evaluation, criticism, and even intimidation. This is because we commonly and regularly evaluate our own and others' intentions as good, bad, or indifferent, and know that it we voice such evaluations, they are likely to influence other's behaviour. So we praise intentions which lead to behaviour we would like to see repeated or reinforced, blame intentions leading to things we would want to prevent or avoid, and rate the rest as indifferent. In other words, you could say that mentalism provides us with means to name, blame, and shame (or alternatively to except, exonerate, and extol—something we are particularly good at when the subject is ourselves). Indeed, at the end of the first chapter we saw some examples of mentalistic manipulation at its most monstrous in the case of Bruno Bettelheim's reign of terror at the Orthogenic School (see above pp. xx-xx).

If autistics have deficits in mentalism, then they should also show a deficit here: in other words, they should be less concerned with naming, blaming, and shaming than normal. I know of no scientific study that has ever investigated this, but the following quotation from the autobiography of one diagnosed autistic suggests that, at least in his case, the prediction is fulfilled:

A lot of things to me just are—not good or bad—they just exist. I often wonder why others seem to exert a lot of energy deciding whether others are good, bad, ugly or beautiful. This is a skill that I don't seem to have nor care to cultivate. This does not mean I am unaware of the difference between right and wrong or bad and good...

It just seems to me that a lot of what goes on in the daily judging of others and their actions is not worth the energy expended in doing so.[275]

Speaking about her two autistic sons, the mother I quoted earlier reports of her boys that

Many of the most aggravating habits of normal children are refreshingly absent. The boys have plenty of aggravating habits of their own, of course, but they don't whinge, compete, squabble or blame other people for their own shortcomings. They don't exaggerate minor injuries or try to get someone else into trouble. . I never hear those tiresome phrases like "It's not fair" or "He started it" or "Are we nearly there?" . They may get cross with me when I thwart their desires, but they never criticize me, or anyone else. They never clamour for expensive treats or insist on their rights; they are unmoved by crazes and playground fashions. They haven't the least notion of "cool". They are immune to peer pressure. They are always completely themselves.[276]

One reason why autistics are almost always found to be wilful and recalcitrant in certain respects may be that their mentalistic deficits also make them less vulnerable to this censorious aspect of mentalism than others. To put it another way, you could say that autistics are not so easy to name, blame, and shame as people with normal mental sensitivities. For example, speaking of the original cases on which his diagnosis was built, a recent commentator points out that

Asperger often regarded the children as being "distracted from within/or by themselves". Furthermore, half of the children displayed disciplinary problems, negativism or conduct difficulties, particularly at school; they did not listen to what the teacher said or only followed their own "spontaneous", idiosyncratic ideas. They were described as disrespectful towards authority, and could come across as impudent and blunt because they would speak out freely without thinking while being quite unaware of the situation or the status of the person to whom they were speaking.[277]

Hugh Blair's immunity to shame at least is suggested by the contemporary observation that "bid to uncover his nakedness . he did without seeming to know that there was any indecency therein"[278]. Today such behaviour might have landed Blair in court on a charge of indecent exposure, and we have already seen that one notorious criminal, the so-called Unabomber, Theodore Kaczynski, has been diagnosed as an Asperger's case (see above: pp. xx-xx). An authority on autism in adults points out that "the vulnerability and honesty of people with autism can be to easily exploited or abused. They are the ones left holding the brick outside the video centre whilst the

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[275] Shore, S., *Beyond the Wall: Personal Experiences with Autism and Asperger Syndrome*. 2001, Shawnee Mission, Kansas: Autism Asperger Publishing Co. 174.

[276] Moore, C., *George and Sam*. 2004, London: Viking. 252.

[277] Hippler, K. and C. Klicpera, *A retrospective analysis of the clinical case records of 'autistic psychopaths' diagnosed by Hans Asperger and his teaching at the University Children's Hospital, Vienna*, in *Autism: mind and brain*, U. Frith and E. Hill, Editors. 2004, Oxford University Press: Oxford. p. 21-42.

[278] Houston, R. and U. Frith, *Autism in History: The Case of Hugh Blair of Borgue*. 2000, Oxford: Blackwell. 207.

other youths have made off with the goods; it is they who may be used to shop-lift, or even drive a stolen car whilst other people wait in the background"[279].

At present, autism does not figure prominently in forensic psychiatry or in pleas of mitigation in law courts, despite the passing comment of one authority that Asperger's cases are found in "high numbers in secure prison hospitals"[280]. Nevertheless, the considerations touched on here suggest that, with greater understanding of the condition, the situation could change. After all, if a deficit in mentalism is indeed central to autistic spectrum disorders, and if as I am suggesting here, such deficits can have far-reaching implications for autistics' social adaptation, then it is not hard to see that some individuals could become involved in behaviour that was not merely antisocial but actually criminal. Indeed, in some cases you can see how this could combine with autistics' special interests and expertise in certain areas, such as the Unabomber's engineering and wood-working skills, or another autistic's interest in locks which led him to become an expert lock-picker (although, he assures us, never a thief[281].

In his account of Temple Grandin Oliver Sacks comments on "the touching simplicity and ingenuousness of Temple's writing" and "her incapacity for evasion or artifice of any kind"[282]. Temple Grandin herself remarks that

Autistic people tend to have difficulty lying because of the complex emotions involved in deception. I become extremely anxious when I have to tell a little white lie on the spur of the moment. To be able to tell the smallest fib, I have to rehearse it many times in my mind. I run video simulations of all the different things the other person might ask. If the other person comes up with an unexpected question, I panic. Being deceptive while interacting with someone is extremely difficult unless I have fully rehearsed all possible responses. Lying is very anxiety-provoking because it requires rapid interpretations of subtle social cues to determine whether the other person is really being deceived.[283]

As other writers have pointed out, successful lying requires not just competence in understanding false-belief situations, but real skill in exploiting and manipulating them, and this, as we have already seen, autistics notoriously lack (see above pp. xx-xx). Perhaps not surprisingly then, brain-imaging reveals that there is more brain activity when lying than when telling the truth. Areas activated when lying are predominantly left hemisphere ones involved in attention, error-detection, initiation, and voluntary movement (specifically, the anterior cingulated cortex and pre-frontal and

[279] Howlin, P., *Autism: Preparing for Adulthood*. 2003, London: Routledge. 293.

[280] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[281] Shore, S., *Beyond the Wall: Personal Experiences with Autism and Asperger Syndrome*. 2001, Shawnee Mission, Kansas: Autism Asperger Publishing Co. 174.

[282] Sacks, O., *An Anthropologist on Mars: Seven Paradoxical Tales*. 1995, London: Picador. 318.

[283] Grandin, T., *Thinking in Pictures and other reports from my life with autism*. 1995, New York: Vintage Books. 222.

pre-motor cortices)[284]. Indeed, Temple Grandin follows some leading neuroscientists in suggesting that

Normal people have an *interpreter* in their left brain that takes all the random, contradictory details of whatever they're doing or remembering at the moment, and smoothes everything into one coherent story. If there are details that don't fit, a lot of times they get edited out or revised. Some left brain stories can be so far from reality that they sound like confabulations.[285]

Here, Grandin seems to have Vilayanur Ramachandran's remarkable findings in relation to *anosognosia* (meaning, *ignorance of illness*) in mind. This affliction accompanies a left-side/right hemisphere stroke and usually disappears within a few weeks, but on rare occasions can be permanent. Strokes often paralyse one side of a person's body, but in anosognosia the paralysis goes with complete denial by the patient that the paralysis has occurred. A striking characteristic of anosognosia is the extent to which patients attempt to rationalize and not simply deny their disability. For example, when asked to perform an action with her paralysed left arm, one patient would usually rationalize her failure with statements such as, "My shoulder hurts a lot today; I have arthritis, you know," or "I didn't really want to point that time." Although the patient could be induced to admit that she was paralysed after several such trials, just 10 minutes later, she not only reverted to denial—insisting that her left hand was fully functional—but also claimed that she had successfully used that hand during the preceding testing session! This was despite the fact that her memory for other details of that session was completely accurate. Ramachandran, who described this case, reports that it was almost as if she had "forgotten" or selectively repressed the memory of her failed attempts as well as her verbal acknowledgement of her paralysis.

An additional reason for thinking that anosognosic patients do indeed know somewhere in their brains that they are paralysed but cannot access the realization is the astonishing discovery that the condition can be temporarily cured by pouring icy water into the patient's left ear. Given that anosognosia is linked to paralysis only on the left side of the body, it seems plausible to suppose that irrigation of the left ear with cold water stimulates the right hemisphere, and in particular the *vestibular system*, which is connected to the semi-circular canals of the ear and is concerned with maintaining balance and a sense of the orientation of the body. Irrigation of the left ear with resulting stimulation of the vestibular system's links with the affected right hemisphere appears to temporarily restore whatever function of the right brain is compromised in anosognosia and to allow a remission during the treatment and for about 30 minutes afterwards. During this time, the patient not only openly admits to the paralysis, but shows evidence of having laid down episodic memories consistent with this realization throughout the previous period of denial. Ramachandran comments that it is almost as

[284] Slotnick, R.S., *Diogenes' New Lamp.* American Scientist, 2002. **90**: p. 127-8.

[285] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode Animal Behavior*. 2005, New York: Scribner. 357.

if the irrigation treatment had revealed two separate conscious human beings who are mutually amnesic: a "cold water" person who is intellectually honest and acknowledges the paralysis, and an anosognosic one who completely denies it[286]!

Of course, you could dismiss such findings as limited to cases of brain pathology like strokes, but Ramachandran is not so easily convinced. On the contrary, he suggests that "what one is really seeing in these patients is an amplified version of Freudian defence mechanisms caught *in flagrante delicto*; mechanisms of precisely the same sort that we all use in our daily lives". Ramachandran concludes that "Contrary to the frequently expressed view that memory repression is not a real phenomenon, my findings provide compelling experimental/clinical evidence that it is indeed a robust psychological process"[287].

Ramachandran also suggests that there is an unconscious "anomaly detector" in the right hemisphere whose sole purpose is to serve as a "Devil's Advocate" that periodically challenges the left hemisphere's "story", and detects anomalies or discrepancies. He speculates that when the anomaly reaches a critical threshold, an interaction with the right hemisphere forces a complete change in your world view. Ramachandran adds that you could think of the anomaly detector "as a mechanism for preserving intellectual honesty or integrity. ... I might be willing to engage in some minor rationalization, i.e., make some small false assumptions to get on with my life, but when the false beliefs become too far removed from reality, my anomaly detector kicks in and makes me re-evaluate the situation"[288].

Further evidence for this interpretation comes from an experiment in which an anosognosic patient's paralysed left hand was put inside a box with hidden mirrors which allowed the experimenter to make it appear to move. This was done by having the patient wear a glove on the hand and contriving the mirrors in such a way that a hidden accomplice's gloved hand looked as if it was the patient's. The patient was first tested by being asked to clap, and proceeded to do so Zen Buddhist style, with only one hand, but claimed to be clapping normally! When asked to move her paralysed hand placed within the box to the sound of a metronome, the patient was not surprised to see it moving, despite the fact that it was of course the accomplice's hand which she saw in motion. But when the accomplice's hand was kept still like the patient's real hand, the patient also nevertheless claimed to see it moving. According to Ramachandran,

When confronted with the contradictory information from her different sensory systems, her left hemisphere tries to impose consistency by simply inserting the required evidence, i.e., the visual appearance of a moving right hand. Since she has a malfunctioning anomaly detector in her right hemisphere, this bizarre delusion goes unchecked

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[286] Ramachandran, V.S., *The Evolutionary Biology of Self-Deception, Laughter, Dreaming and Depression: Some Clues from Anosognosia.* Medical Hypotheses, 1996. **47**(5): p. 347-362.

[287] Ramachandran, V.S., *Anosognosia in parietal lobe syndrome.* Consciousness and Cognition, 1995. **4**: p. 22-51.

[288] Ramachandran, V.S., *Anosognosia in parietal lobe syndrome.* Consciousness and Cognition, 1995. **4**: p. 22-51.

and, consequently, she reports that she can actually see her hand moving even though this belief is contradicted by the visual appearance of a stationary hand.[289]

What Ramachandran calls a striving to impose consistency is close to what we have already seen autism researchers defining as *central coherence* (see above pp. xx-xx). And we also saw earlier in this chapter that autobiographical memory is ideally coherent with a person's self-image. Conway gives some illustrative examples of this—and indeed has suggested that it is impossible to induce false memories in people which disrupt such central self-coherence (although autistics' characteristic weak central coherence and sense of self suggests that they may be exceptions)[290]. Again, Ramachandran's right hemisphere "anomaly detector" recalls Temple Grandin's "little scientist in the corner/little bird watching my own behaviour from up high" quoted earlier, and is strongly reminiscent of the flair for finding details and discrepancies that many Asperger's subjects show, for example in their ability to solve hidden-figure puzzles, and as we have seen is otherwise described as *field independence* (see above pp. xx-xx). So to this extent you could certainly see the left hemisphere as more mentalistic/centrally-coherent and the right as more "autistic"/field-independent in the sense of being less mentalistic and perhaps more mechanistic.

Evidence that this left-hemisphere cognitive stance may also extend to purely mental matters and to memory is provided by a study which compared autistics with normal controls in memory tests which discriminated between true and false recollection of previously studied lists of words. To quote the experimenters:

the autistic spectrum disorder group showed significantly less false recognition of semantically related lure words than did the healthy controls. However, the autistic spectrum disorder group showed normal hit rates for previously studied words, resulting in greater discrimination between true and false memories than in the control group. The autistic spectrum disorder group appeared to be relying on a highly literal form of memory, missing out misattributions resulting in false recognition responses.[291]

We also saw that the savant syndrome found in 10 per cent of autistics and Asperger's patients has been associated with right-hemisphere enhancement, skills, and developmental peculiarities, perhaps linked with left-hemisphere deficits and/or delays (see above pp. xx-xx). Ramachandran's interpretation of the remarkable findings from anosognosia suggest that in everyone there may be a marked difference in mentalism between the two sides of the brain, with the left, normally dominant and conscious hemisphere being more mentalistic, verbal, and centrally-coherent than the right, which is more "autistic" by comparison—and certainly less verbal and less centrally-coherent.

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[289] Ramachandran, V.S., *Anosognosia in parietal lobe syndrome.* Consciousness and Cognition, 1995. **4**: p. 22-51.

[290] Anderson, M., C. and C. Green, *Suppressing unwanted memories by executive control.* Nature, 2001. **410**: p. 366-9.

[291] Schacter, D.L. and C.S. Dodson, *Misattribution, false recognition and the sins of memory*, in *Episodic Memory: New Directions in Research*, A. Baddeley, J.P. Aggleton, and M.A. Conway, Editors. 2002, Oxford University Press: Oxford. p. 71-85.

The findings of so-called *split-brain research* point in the same direction. This term refers to a surgical procedure in which the corpus callosum—the connection between the two halves of the cortex (see above pp. xxx-xxx)—has either been wholly or partially cut, so that each half of the brain is even less connected to the other than normal, and consequently even more independent[292]. Nerves from one side of the body are, in the main, connected to the opposite side of the brain. Normally, we do not notice this because the two sides of the cortex communicate with one another. However, in split-brain patients the difference between left and right becomes dramatically apparent. The one extraordinary defect revealed by these studies, quite unlike anything seen in animals, is that subjects are unable verbally to describe experiences of the left half of the visual field or of the left hand. Though both hemispheres register awareness, only the left can write or speak[293]. If a stimulus-word like "laugh" is flashed up on a screen only seen by the left visual field (and therefore by the right hemisphere) one patient laughed and when asked why replied, "You guys come up and test us every month. What a way to make a living!" Patients will respond to similar left visual field stimulus-words such as "walk" and will provide various explanations when asked why they did so—such as wanting to go to get a drink. According to the experimenter, "However you manipulate this type of test, it always yields the same kind of result"[294].

It is worth pausing for a moment to notice how "autistic" in some respects these experiments show the right hemisphere to be. As we have already seen, autistics are notoriously poor at many mental and verbal skills, and are often easily led, and in some situations highly suggestible. Here, the right hemisphere seems much the same: lacking in full conscious awareness and unable to verbalize the true reasons for its actions as we have seen autistics often to be, yet also very vulnerable to suggestion. At the very least, the right hemisphere seems to have notable deficits in mentalism by comparison to its much more competently mentalistic equivalent on the left, and so to this extent you could say that there was something of an autistic in all of us. For the normal majority, it appears to be limited to the right hemisphere, but in autistics evidently affects the left, normally more mentalistic hemisphere too. However, autistics' left hemisphere's deficits in mentalism and central coherence might make it all the more difficult for them to exploit false beliefs successfully in themselves and others. Certainly, Temple Grandin believes that "autistic people don't seem to have repression. Or if they do, they have it only to a weak degree". Speaking of herself, she remarks that she doesn't think she has any of Freud's defence mechanisms, and is "always amazed when normal people do". Indeed, she claims not to have an unconscious at all[295]!

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[292] Bogen, J.E., *Partial hemispheric independence with the neocommissures intact*, in *Brain Circuits and Functions of the Mind*, C. Trevarthen, Editor. 1990, Cambridge University Press: Cambridge. p. 215-30.

[293] Trevarthen, C., *Brain Circuits and Functions of the Mind: Essays in honor of Roger W. Sperry.* 1990, Cambridge: Cambridge University Press.

[294] Gazzaniga, M.S., *Nature's Mind.* 1994, London: Penguin Books.

[295] Grandin, T. and C. Johnson, *Animals in Translation: Using the Mysteries of Autism to Decode*

Of course, you could dismiss such denials as symptomatic of the characteristic hypomentalism of autistics—at least where insight into their own minds is concerned. In other words, if autistics can't read other people's minds, why should we expect them to be able to read their own? And if most of what goes on in the brain is unconscious as it is indeed known to be, is it any wonder that an autistic ends up knowing even less about their own unconscious than many less mentalistically-deficient people do? Nevertheless, you could also wonder whether the mentalistic deficits of autistics mean that their ability to deceive themselves is much less well developed than that of normal people. And given the deficit that we have already seen autistics show in a sense of self, this suggests that the fundamental motives for defence—self-protection, self-promotion and self-justification—are likely to be muted in autistics, and perhaps sometimes even absent altogether, further explaining their characteristic tendency to candour.

For reasons like those discussed in this chapter, people with autism spectrum disorders are in the words of one leading diagnostician very much "truth-seekers"[296], and tend to be immune to many commonplace contemporary prejudices. Articulate autistics speak of themselves as defiant "in the face of orthodoxy" and as despising and loathing "the system of the world, with its fashions and trends and flimsy ideas and philosophies, its media and social conditioning". Indeed, the same person reports that he would sometimes make the mistake of bringing this superficiality to the attention of odd individuals. "'Have you noticed how false everyone is?' I would start. 'The way they change depending on whose company they are in? They talk one way when they are on their own, and a completely different way when they're with their friends—sometimes even altering their feelings and beliefs to suit.' He concludes, "It's because they're scared of being themselves, you see"— something that we have already seen autistics are not[297]. As a result, autistics represent a unique challenge to the rest of the human race: "Autism, with its indifference to cultural values, implies an existential critique of society. It questions some of its most valued concepts... Society is challenged and humbled by the sheer existence of people who are unmoved by values that it takes for granted"[298]. Like extra-terrestrials who have lived unsuspected on Earth, "These mysterious, impossible, enchanting beings will always be among us, unwitting yardsticks for our own moral behaviour, uncomprehending challengers of our definition of what it means to be human"[299]. Certainly, the combination of an alternative way of looking at life with unusual cognitive gifts and an inability to dissimulate or package

Animal Behavior. 2005, New York: Scribner. 357.

[296] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[297] Hadcroft, W., *The Feeling's Unmutual: Growing Up with Asperger Syndrome (Undiagnosed)*. 2005, London: Jessica Kingsley Publishers. 236.

[298] Houston, R. and U. Frith, *Autism in History: The Case of Hugh Blair of Borgue*. 2000, Oxford: Blackwell. 207.

[299] Moore, C., *George and Sam*. 2004, London: Viking. 252.

the truth for popular consumption means that the insights of autistics represent the only genuinely alien intelligence about ourselves that we have had to date.

4. Hyper-mentalism, Schreber, and Psychosis

At the beginning of the last chapter we saw that monitoring of gaze is a plausible evolutionary origin for mentalism, and that such awareness of attention would lead naturally to intuition of intention and mental agency. We also noted that autistics were symptomatically deficient where sensitivity to gaze was concerned (see above pp. xx- xx). However, the same cannot be said of Rupert Sheldrake. In his recent book, *The Sense of Being Stared At and Other Aspects of the Extended Mind,* this writer reports that he often turns around to find "someone staring at me"[300]. He adds that, according to his own surveys of adults in Europe and in the United States, 70 to 90 per cent said that they had sensed when they were being looked at from behind. Indeed, it is the considered view of this author that such a sense of being spied on can even be derived from closer-circuit TV cameras and other types of remote imaging, and he provides many anecdotes which he believes illustrate the point. He also includes a lengthy discussion of the "evil eye" as an instance of "the fact that people do seem able to influence others by their looks"[301].

As Sheldrake himself points out, people's awareness of being looked at by others could be explained by sensitivity "to sounds, to movements in their peripheral field of vision, or to other subtle sensory clues, perceived subliminally. ... People may often turn around but only remember the occasions when someone was staring at them, and forget all the times they turned and no one was looking." Indeed, he adds that "This illusion would be enhanced by the tendency for our visual systems to detect movement. As we turn around to look behind us, if someone behind us sees us moving, we are likely to attract their attention, and our eyes meet"[302]. In a series of experiments published after Sheldrake's book, 40 subjects were repeatedly shown images for a fraction of second separated by blanks. Sometimes the images remained the same, but sometimes they were subtly different. In the latter case, about a third of the experimental subjects reported a feeling that the image had changed before they could identify what the change was; but in control trials the same people proved that they could reliably tell

[300] Sheldrake, R., *The Sense of Being Stared At and Other Aspects of the Extended Mind.* 2003, London: Hutchinson. 372.

[301] Sheldrake, R., *The Sense of Being Stared At and Other Aspects of the Extended Mind.* 2003, London: Hutchinson. 372.

[302] Sheldrake, R., *The Sense of Being Stared At and Other Aspects of the Extended Mind.* 2003, London: Hutchinson. 372.

when no change had occurred. According to the researcher, "this explains a lot of the belief in a sixth sense" and he adds that "Our visual system can produce a gut feeling that something has changed even if we cannot visualize that change mentally"[303].

But according to Sheldrake, there is not just a sixth sense, but a seventh also—one identified with what he calls "the extended mind." Indeed, Sheldrake is prepared to challenge what he calls the "intromission" theory of vision and visual perception within the brain put forward by modern science as nothing more than "a dogma accepted on the authority of science". In his view, "Educated people have been brought up to believe that their minds are located inside their heads, and that all their perceptions and experiences are somehow concentrated in their brains." He goes on to "propose that vision involves a two-way process, an inward movement of light, and an outward projection of images"[304].

Of course, there is much truth in the claim that vision—like most other perceptions, but probably much more so—involves a two-way process in the sense that what we see is demonstrably constructed by our brains somewhat in the way in which computers generate virtual images. Certainly, whatever we are conscious of seeing is not what appears directly on our retinas. On the contrary, retinal images are inverted, have a significant hole near the centre (the blind-spot) and are processed separately as left and right halves of the visual field in opposite hemispheres of the brain. Only in our subjective, mental perception are the two halves of the visual field seamlessly joined, put the right way up, and shown without any obvious sign of a blind-spot. Furthermore, there is evidence that some visual hallucinations definitely originate within the visual system itself, and represent artefacts of the visual processing mechanism projected out into the virtual reality that our brains construct[305][306][307][308].

But this is evidently not what Sheldrake means. He goes on to say that "This outward perception occurs within mental fields, which I call perceptual fields." He adds that some may prefer to talk about "vibrations, energy flows, chi or non-local quantum effects" to his use of "field", but concludes that whatever words are preferred, the sense of being stared at must depend on the influence of the looker on the person looked at, on a projection of influences outwards. This sense reveals that through the power of attention the mind is connected to the world beyond the body. If the sense of being stared at is real, it implies a sensitivity that goes beyond hearing, sight, touch, taste and smell—beyond the known senses. It could be thought of as a sixth, or even a

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[303] Philips, H., *Do we perceive using 'mindsight'?*, in *New Scientist*. 2004. p. 14.

[304] Sheldrake, R., *The Sense of Being Stared At and Other Aspects of the Extended Mind*. 2003, London: Hutchinson. 372.

[305] Morgan, M., *The Space Between Our Ears: How the Brain Represents Visual Space*. 2003, London: Weidenfeld & Nicolson. 240.

[306] Ramachandran, V.S., *Blind Spots*. Scientific American, 1992. **266**: p. 85-91.

[307] Ramachandran, V.S. and S. Blakeslee, *Phantoms in the Brain*. 1998, London: Fourth Estate.

[308] Ramachandran, V.S. and R.L. Gregory, *Perceptual Filling In of Artificially Induced Scotomas in Human Vision.* Nature, 1991. **350**: p. 699-702.

seventh sense; alternatively as a form of perception beyond the known senses, in other words extra-sensory perception or psychic ability. Indeed, according to Sheldrake's theory, "Mental fields that extend beyond the brain may also explain telepathy," and he adds that "our own telepathic powers are generally poor compared with those of dogs, cats, horses, parrots, and other species of mammals and birds." He speculates that "They may have a seventh sense that enables them to detect threatening intentions. The may be able to sense when a would-be killer is looking at them, even if they have not yet detected the predator through sight, smell or hearing"[309]. He adds that "This is a potentially dangerous thought. It would be much less disturbing to dismiss the sense of being stared at as an illusion—or even as a form of paranoia"[310].

Certainly, feelings of being watched, stared at, or spied on remarkably similar to those reported by Sheldrake are common in paranoid schizophrenia—so much so that Harry Stack Sullivan (1892-1949), a psychiatrist famed for treating schizophrenics, advised his colleagues to sit at the side of such a patient rather than facing them, never to look them in the eyes (which he found created suspicion), and to address them in the third person. The most famous paranoiac in the psychiatric literature, *Senatsprasident* Daniel Paul Schreber (1842-1911), a German high-court judge who published an autobiographical account of his illness which was later the subject of a paper by Sigmund Freud, eloquently bears out Sullivan's observation[311][312]. Schreber's book has been described as "the most written-about document in all psychiatric literature"[313], and included a section in it entitled "Direction of Gaze" long before the subject had been introduced into discussions of theory of mind. Writing about his psychiatrist, Schreber comments: "I ... gained the impression that Professor Fleschig had secret designs against me; this seemed confirmed when I asked him during a personal visit whether he really honestly believed that I could be cured, and he held out certain hopes, *but could no longer*—at least so it seemed to me—*look me straight in the eye*"[314] [Schreber's emphasis]. Recent laboratory experiments have provided the first direct scientific evidence that people with schizophrenia are indeed unusually sensitive to the direction of another person's gaze. Indeed, the researchers point out that the social deficits seen in schizophrenia could be the outcome of such an over-sensitivity—particularly

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[309] Sheldrake, R., *The Sense of Being Stared At and Other Aspects of the Extended Mind*. 2003, London: Hutchinson. 372.

[310] Sheldrake, R., *The Sense of Being Stared At and Other Aspects of the Extended Mind*. 2003, London: Hutchinson. 372.

[311] Schreber, D.P., *Denkwurdigkeiten eines Nervenkranken.* Memoirs of My Nervous Illness (Wm. Dawson & Sons, London, 1955). 1903, Leipzig: Oswald Wusse.

[312] Freud, S., *Psycho-analytic Notes on an Autobiographical Account of a Case of Paranoia*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1911, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-82.

[313] Dinnage, R., *Introduction*, in *Schreber, D. P. 2000 Memoirs of My Nervous Illness*. 2000, New York Review Books: New York. p. xi-xxiv.

[314] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

in preventing them making accurate inferences about what another person is likely to be thinking[315]. In other words, both excessive sensitivity and insensitivity can result in perceptual deficits. This clearly happens in the case of sensitivity to light causing visual deficits, and it can just as easily occur in relation to social inferences: too much sensitivity can be as bad as too little.

Nowadays paranoid psychotics often extend this morbid sensitivity about direction of gaze to modern technological surrogates for it, and become similarly pathologically pre-occupied with cameras, closed-circuit TV, and radiation-producing mechanisms of many different kinds (evidently sharing Sheldrakes's belief that vision involves an outward projection of some kind even when it emanates from a machine). Such delusions might fit nicely under another of Schreber's headings: "Egocentricity of the rays regarding my person". According to Schreber, "Rays . continually want to see what pleases them, and these are foremost either female beings, through which their sensation of voluptuousness is stimulated, or their own miracles, which give them the joy of having created something (.). My eye-muscles are therefore influenced to move in a certain direction so that my glance *must* fall on things just created (or else a female being)." He explains that "The objective reality of this event cannot be doubted after thousand-fold repetition; why should I have the slightest wish to pay particular attention to any fly, wasp or butterfly etc., which happens to appear around me. One will in any case not dispute that I must *know myself* whether my eyes are *pulled* towards an indifferent object or whether I look at something interesting around me *of my own will*"[316] [Schreber's emphasis].

This is not as absurd as Schreber's characteristic mode of expression may suggest. Indeed, I myself have noticed something similar when reading in bed. Like many married couples, my wife and I share a double bed, and again like many people, we tend to read in bed before sleeping. Normally my eyes are fixed on what I am reading, but I have noticed that often when my wife is looking at the pages of a fashion catalogue or magazine illustrating women's underwear, my eyes mysteriously begin to wonder over to her side (despite the bed being a double king-size)! Schreber would have described this as a miracle stimulated by the "nerves of voluptuousness", but in more mundane terminology it is not difficult to see the explanation. Normally, we are not aware of what is in our peripheral vision, particularly when reading, which requires conscious attention to the centre of our visual field. But an unconscious awareness is always present, ready to claim our attention if it finds something which it may think more interesting or important. Yet conscious awareness lags behind this subliminal perception of peripheral vision, and so, like Schreber, we have occasion to wonder to what extent we consciously choose to look at what we see.

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[315] Langdon, R., et al., *Attentional orienting triggered by gaze in schizophrenia.* Neuropsychologia, 2006. **44**: p. 417-429.

[316] Schreber, D.P., *Memoirs of My Nervous Illness.* New York Review Books Classics. 2000, New York: New York Review Books. 455.

Schreber also often railed at the sun, which he saw as God's eye or as a living being who spoke to him in human language. According to his psychiatrist, "the patient used to stand for a long time motionless in one place, staring into the sun, at the same time grimacing in an extraordinary way or bellowing very loudly at the sun with threats and imprecations, usually repeating endlessly one and the same phrase..."[317]. Although impossible before his illness, in the course of it Schreber believed he could look at the sun without blinking—indeed, the sun's rays visibly paled before him when he did so. Nor was Schreber the only case to show this particular symptom. There are much more recent reports of retinal damage in sun-gazing paranoid schizophrenics[318][319]. Indeed, one study suggests that Schreber's claims may have had a factual basis in the finding that a sub-group of schizophrenic patients have an abnormality in retinal neurons which reduces sensitivity to light[320].

At the very least, an interesting contrast emerges with autism where monitoring gaze is concerned. As we can now begin to see, where autistics have serious deficits in gaze monitoring and interpretation, paranoiacs show startling excesses. Indeed, Rupert Sheldrake's book on the sense of being stared at suggests that even quite normal people can believe that they are supernaturally sensitive to direction of gaze. However, this striking pattern is by no means limited to gaze. Another deficit found in autism is an ability to judge and interpret others' intentions towards oneself: what we discussed in the last chapter under the heading of *intentionality detection*—in other words, having a mental understanding of why people do things (see above pp. xx-xx). But as with sensitivity to gaze, detection of intention can go into overdrive in psychotics like Schreber. According to him "All human activity near me, every view of nature in the garden or from my window stirs certain thoughts in me; when I then hear 'Why only' or 'Why because' spoken into my nerves, I am forced or at least stimulated in immeasurably greater degree than other human beings to contemplate the reason or purpose behind them." As a case in point, he mentions watching workmen in the asylum and adds that "I am unavoidably forced to give myself an account of the reason and purpose of every single job." The result is that "Being continually forced to trace the causal relation of every happening, every feeling, and every idea has given me gradually deeper insight into the essence of almost all natural phenomena and aspects of human activity in art, science, etc., than is achieved by people who do not think it worth while to think about ordinary everyday occurrences." Even being introduced to a "Mr. Schneider" arouses the question of

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[317] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[318] Galaiena, M.L., *Solar retinopathy.* American Journal of Ophthalmology, 1976. **8**(3): p. 304-6.

[319] Gerbaldo, H. and G. Thaker, *Photophilic and photophobic behaviour in patients with schizophrenia and depression.* Canadian Journal of Psychiatry, 1991. **36**(9): p. 677-9.

[320] Gerbaldo, H., et al., *Abnormal electroretinography in schizophrenic patients with a history of sun gazing.* Neuropsychobiology, 1992. **25**(2): p. 99-101.

> why he is called Mr. Schneider? This very peculiar question "why" occupies my nerves automatically—particularly if the question is repeated several times—until their thinking is diverted into another direction. My nerves perhaps answer first: Well, the man's name is Schneider because his father was also called Schneider. But this trivial answer does not really pacify my nerves. Another chain of thought starts about why giving of names was introduced at all among people, its various forms among different peoples at different times, and the various circumstances (profession, origin, particular physical qualities etc. which gave rise to them.[321]

Although Schreber's compulsion to ask "why?" was a characteristically exaggerated one, it was not pathological in itself. The ability to ask why someone did—or just as easily, did not—do something follows as a natural development of prediction of other people's intention. Once we begin to predict what people may do next, we are also bound to ask why they fail to do what we expect, or do what we did not expect. This leads us into interpretation of intention, and such interpretations inevitably pose the question "why?" Schreber's compulsive posing of the question is therefore only an exaggeration or overstatement of a normal, mentalistic response.

Interpretation of intention is quintessentially mentalistic because it suggests numerous purely mental factors that might account for a person's behaviour. Such interpretations raise the issue of people's motives, aims, and beliefs. In order to understand why someone did or did not do something, we need to be able to "get inside their heads" so to speak. By definition, what we think we see in people's minds will be intrinsically mentalistic: we will be forced to consider their state of mind, their emotions, their beliefs, desires, and wishes. All manner of purely mental factors will become germane to the problem of predicting, interpreting, and understanding other people's behaviour once we begin to go beyond the point of mere monitoring of others' intention to true interpretation of it. Indeed, such a mentalistic concern with meaning, motive, and interpretation immediately suggests why the mother of a pair of autistic boys quoted in the last chapter reports that neither of them ever used the word "why"[322]. If this line of reasoning is correct, it was yet another manifestation of the characteristic mind-blindness of autistics and stands in striking contrast to the perpetual "whys?" addressed to himself by Schreber.

Schreber illustrates another very common symptom of paranoia in the voices which he continually heard. These frequently harangued him with insulting imputations, referring to him as "Miss Schreber" and enquiring "Is he not unmanned yet?" At other times he was called "The Prince of Hell" and subject to abuse too vile to be printed. Alternatively, the voices would constantly question him, not only with the constant "whys?" mentioned just now, but with comments that someone else might easily have

[321] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[322] Moore, C., *George and Sam*. 2004, London: Viking. 252.

made, such as "What do you really mean?" or "We have had this before!"[323]. Schreber nicely illustrates my earlier point above about mentalism being a means of constraint and control over others (see above pp. xx-xx) when he asks us to

Imagine a human being planting himself before another and molesting him all day long with unconnected phrases such as the rays use towards me ("If only my," "This then was only." "You are to," etc.) Can one expect anything else of a person spoken to in this manner but that he would throw the other out of the house with a few fitting words of abuse? I also ought to have the right of being master in my own head against the intrusion of strangers.[324]

Perhaps so, but Schreber's protest is only at the very extreme form of naming, blaming, and shaming to which his voices subjected him. It suggests that sensitivity to the comments of others is such an innate, evolved part of normal human mentalism that it can become pathologically sensitive, and operate without external cause, like pain reactions in phantom limbs, or tinnitis (ringing) in the ears, or phosphenes (patches of light) in the eyes. As such it would qualify as yet another symptom of psychosis which contrasts with the marked insensitivity to mentalism seen in autistics. Thanks to their deficits in mentalism, people with autistic tendencies not only fail to understand mental terminology in full, but are often remarkably immune to its intended effects, so that other people perceive them to be callous, self-centred, and insensitive to the wishes and needs of other people. Indeed, far from hearing imagined voices, a common complaint about autistics is that they often seem not to listen to real ones, with the result that autistics are often mistakenly thought to be deaf. According

to one autistic: "Autism makes me hear other people's words but be unable to know what the words mean. Or autism lets me speak my own words without knowing what I am saying or even thinking"[325] quoted by[326].

Paranoid hyper-sensitivity to voices recalls the similar sensitivity to direction of gaze mentioned just now. The researchers who first demonstrated the latter in the laboratory go on to suggest that people with schizophrenia may be "hyper-primed" to detect other people's intentions, and clearly the same could apply to what people say to schizophrenics. They add out that this is consistent with several other lines of evidence that these individuals "over-perceive" other people's intentions. For example, they note that patients with schizophrenia show an enhanced tendency to link perceived intentions with consequences, and to judge the movements of objects as more affected by the actions of people than do healthy controls[327].

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[323] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[324] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[325] Williams, D., *Somebody Somewhere*. 1994, London: Jessica Kingsley Publishers.

[326] Frith, U. and F. Happe, *Theory of mind and self-consciousness: What is it like to be autistic?* Mind and Language, 1999. **14**: p. 23-32.

[327] Langdon, R., et al., *Attentional orienting triggered by gaze in schizophrenia.* Neuropsychologia,

The evidence suggests that this over-sensitivity to intention can take two forms, depending on whether the intention detected is positive or negative. Positive overinterpretation of other's intentions underlies *erotomania* (otherwise known as *de Clerambault's syndrome* or, in the terminology of *DSM IV, erotomanic type delusional disorder).*[1] In this case, the subject delusionally believes that others are attracted to, or are in love with them, and most sufferers are female[(328)]. In his memoirs, the painter, Salvador DaH (1904-89) recounts a memorable case of erotomania on the part of a peasant woman from his native town in Spain, Cadaques. Named Lydia, at the age of twenty she had met the Catalan writer, Eugenio d'Ors, and soon afterwards become convinced that he was in love with her, but had to conceal his passion for her in his writings. When d'Ors ignored all her letters, Lydia became convinced that the texts of his daily column in a newspaper were coded replies. DaH reports that "She explains that this was d'Ors only recourse, for a lady whom Lydia had nicknamed 'Mother of God of August,' and other rivals, would with their perfidy have managed to intercept the correspondence." And, wonderfully anticipating the concept of mentalism elaborated here, DaH adds that "Lydia possessed the most marvellously paranoiac brain aside from my own that I have ever known. ... She would interpret d'Ors's articles as she went along with such felicitous discoveries of coincidence and plays on words that one could not fail to wonder at the bewildering imaginative violence with which the paranoiac spirit can project the image of our inner world upon the outer world, no matter where or in what form or on what pretext. elucidating it word by word in an interpretive delirium so systematic, coherent and dumbfounding that she often verged on genius!"[(329)]. Indeed, although Lydia was never formally diagnosed as paranoid, DaH reports that her sons were committed to an asylum, evidently suffering from delusions that they had discovered radium in Cadaques.

However, negative over-valuation of intention is much more common and is seen in the delusions of persecution which are found in so many paranoid psychotics. We have already seen that Schreber entertained paranoid feelings about his psychiatrist, Professor Flechsig, remarking that "*right from the beginning the more or less definite intention existed to prevent my sleep and later my recovery from the illness resulting from the insomnia for a purpose which cannot at this stage be further specified*"[(330)] [Schreber's emphasis]. But this was just the start of it. Much of Schreber's memoirs is concerned with a much more elaborate delusion of persecution involving what he

[1] See Ian McEwan's novel, *Enduring Love*[(331)]. McEwan, I., *Enduring Love.* 1997, London: Jonathan Cape. and its useful appendices for some further striking examples to those given here.

2006. **44**: p. 417-429.

[(328)] American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders.* Fourth, Text Revision ed. 2000, Washington, DC: American Psychiatric Association. 943.

[(329)] DaH, S., *The Secret Life of Salvador Dali.* Third ed. 1968, London: Vision. 423.

[(330)] Schreber, D.P., *Memoirs of My Nervous Illness.* New York Review Books Classics. 2000, New York: New York Review Books. 455.

[(331)] McEwan, I., *Enduring Love.* 1997, London: Jonathan Cape.

termed "soul-murder": "a plot was laid against me *(...)* the purpose of which was to hand me over to another human being after my nervous illness had been recognized as, or assumed to be, incurable, in such a way that my soul was handed to him, but my body—transformed into a female body.—was then left to that human being for sexual misuse and simply 'forsaken,' in other words left to rot." Schreber adds that the "most disgusting" part of this plot was "that my body, after the intended transformation into a female being, was to suffer some sexual abuse, particularly as there had even been talk for some time of my being thrown to the Asylum attendants for this purpose"[(332)]. Schreber believed that "God himself must have known of the plan, if indeed He was not the instigator, to commit soul murder on me, and to hand over my body in the manner of a female harlot. . All other conceivable methods were therefore tried in the course of time. Always the main idea behind them was to 'forsake' me, that is to say abandon me; at the time I am now discussing it was thought that this could be achieved by unmanning me and allowing my body to be prostituted like that of a female harlot, sometimes by killing me and later by destroying my reason (making me demented)[(333)]. Indeed, Schreber's delusional system centred on a universal struggle of good against evil in which Schreber himself "had to fight a sacred battle for the greatest good of mankind," and from which he says that "the picture emerges of a martyrdom which all in all I can only compare with the crucifixion of Jesus Christ"[(334)].

So not just in relation to monitoring and interpretation of gaze and voice, but also in relation to imputation and interpretation of intention, paranoid schizophrenics like Schreber show a striking contrast with autistics. Whereas autistics often ignore intention to the point of seldom if ever asking why someone did or did not do something, and certainly consistently fail to interpret their own and other people's intentions correctly, paranoid schizophrenics do the opposite. As we have seen, Schreber compulsively questioned people's intentions with his unending "whys?" and showed the proverbial paranoid tendency to feel persecuted by all and sundry while erotomaniancs like Lydia manage to find hidden attentions to themselves where none was ever intended.

Yet another autistic deficit is found in *shared attention mechanism*. Autistic people typically do not become involved in group conversations or activities because they usually fail to understand the element of collective psychological activity that is inevitably involved[(335)]. Temple Grandin noticed

a kind of electricity that goes on between people. I have observed that when several people are together and having a good time, their speech and laughter follow a rhythm. They will all laugh together and then talk quietly until the next laughing cycle. I

[(332)] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[(333)] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[(334)] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[(335)] Leekam, S. and C. Moore, *The Development of Attention and Joint Attention in Children with*

have always had a hard time fitting in with this rhythm, and I usually interrupt conversations without realizing my mistake. The problem is that I can't follow the rhythm.[336]

Indeed, according to Rupert Sheldrake,

when individual animals or people are relating to each other through the normal senses, telepathy may play an essential role in the normal communication of intentions, images and thoughts. For example, when two people are sitting talking to each other, they are not only linked through the words that are said and heard, but through body language and visual contact, through the shared environment, and so on. If they know each other well, then they are also linked by the emotional bonds between them, and by shared memories. These are all favourable conditions for telepathy, and favour the transfer of feelings, images, concepts and ideas.[337]

Once again, paranoiacs are characteristically even more mentalistic and are given to imagining not mere telepathic communication, but concerted group activity often expressed as conspiracies against them, as the last quotation above from Schreber illustrates. To take another example, Schreber noticed that "as soon as I sit down on a bench in the garden and ... close my eyes, which would in a short time lead to sleep .., *a fly, wasp or bumble-bee or a whole swarm of gnats appears* to prevent me from sleeping." Indeed, he goes on to add that he has "most stringent and convincing proofs of the fact that these beings do not fly towards me by accident, but are beings newly created for my sake each time!"[338] [Schreber's emphasis]. Even more annoyingly, he also believed that, whenever he wished to go there himself, "some other person in my vicinity was sent (by having his nerves stimulated for that purpose) to the lavatory, in order to prevent me evacuating." He assures us that "This is a phenomenon which I have observed for years and upon such countless occasions—thousands of them—and with such regularity, as to exclude any possibility of its being attributable to chance"[339]!

Paranoid delusions of conspiracy, in other words, can be seen as fantastic elaborations of the shared-attention mechanism that enables normal people to understand what goes on in groups, meetings, and social gatherings of all kinds. Although autistics find appreciating what goes on in a group difficult, and often give it little serious thought or attention, paranoid psychotics pay far to much attention to groups, and tend to see conspiracies everywhere and imagine everyone plotting behind their backs.

Autism, in *The Development of Autism: Perspectives from Theory and Research*, J.A. Burack, et al., Editors. 2001, Erlbaum: Mahwah, NJ. p. 105-29.

[336] Grandin, T., *Thinking in Pictures and other reports from my life with autism*. 1995, New York: Vintage Books. 222.

[337] Sheldrake, R., *The Sense of Being Stared At and Other Aspects of the Extended Mind*. 2003, London: Hutchinson. 372.

[338] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[339] Freud, S., *Psycho-analytic Notes on an Autobiographical Account of a Case of Paranoia*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1911, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-82.

Indeed, for paranoiacs like Schreber, life was one vast, cosmic conspiracy implicating not just other human beings both alive and dead, but God himself.

The same pattern of pathological exaggeration of a normal aspect of mentalism is found in relation to memory in paranoid psychotics like Schreber, who often fabricate complex and colourful autobiographical memories[340]. As we saw in the previous chapter, episodic/autobiographical memory is deficient in autistics (see above pp. xx- xx), but Schreber's memoirs once again provide plenty of anecdotic evidence for excesses, both in episodic memory, and indeed in a sense of personal agency. Schreber's very title, *Memoirs of My Nervous Illness*, immediately reminds us that the entire book is one long account of the episodic/autobiographical memories of one particular person. Furthermore, this is a person who finds no difficulty in remembering himself being involved in events. On the contrary, many of he bizarre details of the *Memoirs* derive from Schreber's characteristically paranoid tendency to over-mentalize, and to exaggerate his own role, not only in his own history, but in that of the entire universe—central coherence with a vengeance (see above pp. xx-xx)!

One reason why Schreber wrote the book and thought it to be so important was that he believed that through his personal experiences he had gained unique insights into reality denied to others and had come "infinitely closer to the truth" than others had. His self-confessed aim was "solely to further knowledge of truth" and he believed himself "infinitely closer to the truth than human beings who have not received divine revelation." Nor did he consider himself unduly credulous, remarking that he had belonged to the category of doubters where religion was concerned, at least "until divine revelation taught me better"[341]. Indeed, he adds that "Whoever knew me intimately in my earlier life will bear witness that I had been a person of calm nature, without passion, clear-thinking and sober, whose individual gift lay much more in the direction of cool intellectual criticism than in the creative activity of an unbounded imagination." Not surprisingly then, he goes on to remark that "It seems psychologically impossible that *I* suffer only from hallucinations," and adds that "I can claim two qualities for myself without reservation, namely *absolute truthfulness and more than usually keen powers of observation*"[342] [Schreber's emphasis].

For a writer who owes most of his justly deserved fame to his beautifully-written account of his delusional system and its consequences for his life, this represents a very high level of self-deception. Indeed, you could see this as another striking contrast between autism and paranoia: namely, that where autistics are often pathologically literal and truthful (see above pp. xx-xx), paranoiacs are prone to extreme self-deception and

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[340] Salazar-Fraile, J., et al., *Recall and recognition confabulation in psychotic and bipolar disorders: evidence for two different types without unitary mechanisms.* Comprehensive psychiatry, 2004. **45**(4): p. 281-282.

[341] Schreber, D.P., *Memoirs of My Nervous Illness.* New York Review Books Classics. 2000, New York: New York Review Books. 455.

[342] Schreber, D.P., *Memoirs of My Nervous Illness.* New York Review Books Classics. 2000, New York: New York Review Books. 455.

wildly erroneous perception resulting in the bizarre delusional thinking that usually typifies the untreated condition.

Schreber gives us the full flavour of both rich autobiographical memory and time travel into the past which it allows when he begins the second chapter of his book by claiming that the "miraculous structure" of the universe "has recently suffered a rent, intimately connected with my personal fate. But it is impossible even for me to present the deeper connections in a way which human understanding can fully grasp. My personal experiences enable me to lift the veil only partially..."[343]. Indeed, Schreber came to believe that his encounter with his psychiatrist, Dr Flechsig—definitely a real episode in his past—had historical precedents reaching back much further: "I therefore concluded that at one time something had happened between perhaps earlier generations of the Flechsig and Schreber families." and goes on to name the individuals involved, some of whom he imagined to have lived in the previous century[344]. Here not just autobiographical memory, but history itself is transformed in a manner that is wholly and centrally coherent with Schreber's beliefs about himself and his role in the greater scheme of things.

Nevertheless, it would be wrong to think that all Schreber's ostensible memories were as false or completely fantastic. On the contrary, much of Schreber's book is taken up with a harrowing account of his incarceration in a number of mental institutions and of the frightful experiences he had in them. In other words, Schreber's memories may be pathologically elaborated, but they are not necessarily factually inaccurate in all their details. Intermingled with Schreber's delusions, there is clearly much truth. According to this way of looking at it, Schreber's written recollections of his mental illness enshrine a bizarre exaggeration of normal mentalism, rather than a completely different, or alien mode of thought. Here, perhaps the most striking example is Schreber's extreme embellishment of the normal mentalistic ability to include yourself in episodic/autobiographical memories which shows itself in his delusion that he was the only real human being alive, and that others were "fleetingly improvised"—mere allusions to human beings: "During the latter part of my stay at Flechsig's Asylum I thought . that I was the last real human being left, and that the few human shapes whom I saw apart from myself—Professor Flechsig, some attendants, occasional more or less strange-looking patients—were only 'fleetingly improvised men' created by miracle"[345]. Many if not most of these people were clearly real persons whom Schreber encountered, but their reduction to mere ciphers for persons underlines the central role that Schreber's own self always plays in the *Memoirs*. Others may be remembered, but they are recalled only in reference to Schreber himself, and appear to have little other

[343] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[344] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[345] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

significance apart from their connection with him. Where autistics typically fail to include themselves in their episodic memories (see above pp. xx-xx), paranoiacs like Schreber appear to fail to include anyone *but* themselves.

Finally, as we have already seen, autistic people are generally deficient in theory of mind. Indeed, the most general expression of the characteristic mind-blindness of autistics is that they fail to attribute mental states to others and to react to them appropriately). But here again, paranoia shows the opposite tendency. The evolutionary psychiatrist, Randolph Nesse, notes that "those who have worked with schizophrenics know the eerie feeling of being with someone whose intuitions are acutely tuned to the subtlest unintentional cues, even while the person is incapable of accurate empathic understanding"[346]. Furthermore, there are grounds for believing that such subjective impressions are by no means inaccurate. Experiments on schizophrenics' mind-reading abilities have seldom been carried out, and might be open to question in relation to the often very effective drug therapies to which such patients nowadays are normally subjected. Nevertheless, at least one carefully controlled study suggests that paranoid patients even when on medication are demonstrably better than normal controls in interpreting non-verbal cues—at least where the resulting expressions are genuine and where the situation is one of expectation of an electric shock. With simulated expressions, normal subjects performed better than paranoid ones, but as the experimenter herself points out, this is just what you would expect if you thought that paranoiacs have a special sensitivity to non-verbal cues[347].

Indeed, this is much as the term is used in everyday speech: we are likely—perhaps jokingly, perhaps not—to suggest that someone is being "paranoid" if we think that they are being over-sensitive to someone else's behaviour or expressions and consequently finding motives or meanings where there are none. In other words, you could say that in such instances we are suggesting that whoever is being "paranoid" is reading too much into someone else's mind, rather than too little, as autistics typically do. In genuine paranoia such excessive mentalizing means that although paranoid schizophrenics may indeed be more sensitive to expressions of others' states of mind in certain respects, they are nevertheless as likely to over-interpret them erroneously as autistics are likely to under-interpret them.

In Schreber's case this tendency, which we have already noted in relation to direction of gaze and interpretation of intention and shared attention, went with a readiness to attribute minds—or what he actually called "bemiracled residues of former human souls"—to birds and trees and generally to mentalize—he would have called it to "spiritualize"—the whole world. According to the language of the souls he heard speaking to him, Schreber was called "the seer of spirits," and he saw them everywhere, not merely in animals and plants, but in the heavens. The Sun's rays were by turns

[346] Nesse, R.M., *Cliff-edged fitness functions and the persistence of schizophrenia.* Behavioral and Brain Sciences, 2004. **27**: p. 862-863.

[347] LaRusso, L., *Sensitivity of Paranoid Patients to Nonverbal Cues.* Journal of Abnormal Psychology, 1978. **87**(5): p. 463-471.

the "nerves of God" or "God's spermatozoa," and according to Schreber, "it appeared that nerves—probably taken from my body—were strung over the whole heavenly vault"[348].

Indeed, not merely in the external world, but in his own self, Schreber found other minds. This was graphically portrayed by his delusion that "on one occasion 240 Benedictine Monks under the leader of a Father whose name sounded like Starkiewicz, suddenly moved into my head to perish therein." Among other souls who invaded Schreber's head was a group which consisted mainly of former members of the Students' Corps, Saxonia, from Leipzig, not to mention relatives, friends, former colleagues and doctors who had treated him in the past[349]. And it was not just in his mind, but in his body too that he felt the presence of these other minds. He noticed that "friendly souls always tended more towards the region of my sexual organs (of the abdomen etc.) where they did little damage and hardly molested me, whereas inimical souls always aspired towards my head, on which they wanted to inflict some damage, and sat particularly on my left ear in a highly disturbing manner"[350]. Schreber underlines the essentially human character of these presences within him and the mentalistic quality of his interpretation of them when he adds that "I saw ... 'little men' innumerable times with my mind's eye and heard their voices." And just in case anyone should think him incapable of distinguishing the mental from the physical he adds in a footnote to this sentence: "Of course one can *not* see with the *bodily* eye what goes on inside one's own body, nor on certain parts of its surface, for instance on the top of the head or on the back, but— as in my case—one can see it *with one's mind's eye...*"—or, as I would prefer to put it, *mentalistically*[351] [Schreber's emphasis].

Another way of describing this tendency to mentalize to excess is what has been called *magical ideation*. The Magical Ideation Scale developed at the University of Wisconsin presents a questionnaire asking the respondent to agree or disagree with a list of statements. These range from what you might call commonplace superstition (such as "Horoscopes are right too often for it to be a coincidence") to some with a distinctly delusional tone, themselves ranging from the erotomanic ("I sometimes have the passing thought that strangers are in love with me") to the more conventionally paranoid ("I have sometimes sensed an evil presence around me"). Also included are many sentiments endorsed by conventional religions ("I have wondered whether the spirits of the dead can influence the living"); belief in the paranormal ("I think I could learn to read other people's minds if I wanted to"); or even extra-terrestrial life ("The

[348] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[349] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[350] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[351] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

government refuses to tell us the truth about flying saucers")[352]. Students who scored high on the scale also showed more psychotic symptoms than students with lower scores, and in a study of psychiatric patients those with schizophrenia had a higher magical ideation score than non-schizophrenic patients or normal controls. A longitudinal study of 7,800 students revealed that students who scored high on magical ideation in college showed more symptoms of so-called *schizotypal personality* and other schizophrenia-related disorders a decade later, and also reported more psychotic experiences than others. Ten years later, the number of people who had developed some form of psychosis was significantly greater in the group that had scored high on magical ideation.[353].

These findings make complete sense if you consider the fact that mentalistic thinking, although perfectly true and applicable in its own, proper psychological setting, inevitably becomes delusional if substituted for mechanistic cognition of the physical world. We have already seen how easily even erstwhile scientific writers like Sheldrake can begin to credit ideas like the Evil Eye and sixth—or in his case, even seventh—senses in relation to vision and attention, and I will mention more examples in a moment. However, intention can even more easily be extended beyond its proper, purely mental domain. Another of the statements from the Magical Ideation Questionnaire reads, "I have felt that I might cause something to happen just by thinking about it too much". Schreber illustrates the extreme culmination of this kind of thinking when we find him vastly overstating his own influence on things, for example in his claim that "the weather is now to a certain extent dependent on *my* actions and thoughts; as soon as I indulge in thinking nothing, or in other words stop an activity which proves the existence of the human mind such as playing chess in the garden the wind arises at once". He concluded that "*everything that happens is in reference to me*"[354] [Schreber's emphasis].

Such *delusions of reference* as they are often called can be seen as an exaggeration of the normal belief in yourself as responsible for your own intentions. They result from extension of the fundamental mentalistic sense of your own responsibility for your conscious acts outwards onto acts and events which in reality cannot be caused by your own mind, intention, or behaviour. Furthermore, such interpretations of intention have a foundation in reality. A case in point might be to inadvertently distract someone's attention so that they do something they did not intend, say drop something, or bungle something that they would normally do perfectly well. In these circumstances you may not have directly intended the accident, but mentalistically you feel responsible because you know that your intervention—albeit quite innocent—probably contributed to the outcome. And from real situations like this it is but a short step to begin to think as

[352] Eckblad, M. and L.J. Chapman, *Magical Ideation as an Indicator of Schizotypy.* Journal of Consulting and Clinical Psychology, 1983. **51**: p. 215225.

[353] Chapman, L.J., et al., *Putatively psychosis prone subjects ten years later.* Journal of Abnormal Psychology, 1994. **103**(171-183).

[354] Schreber, D.P., *Memoirs of My Nervous Illness.* New York Review Books Classics. 2000, New York: New York Review Books. 455.

Schreber evidently did that just about everything that happened around him did so in some way or another in connection with himself. Looked at from this point of view, Schreber's delusions of reference are—as with so many of his symptoms—not so much pathologically unprecedented as extreme exaggerations of normal mentalism.

But of course, intentions can also be retrospectively regretted, and repudiated, particularly if the outcome was less than or contrary to what was intended. For most people, such miscarried intentions become the subjects of private recrimination, personal sorrow, and ultimately perhaps selective amnesia—or at least some degree of self-vindication. We tend to say things like, "I didn't really mean to do it," "That wasn't what I actually intended," or "I would never have wanted this to happen". But here again Schreber shows the process of self-excuse in an extreme form when he asserts that, where he is concerned, "Plates simply break in two without any rough handling, or objects which the servants or others present or even I myself hold (for instance my chessmen, my pen, my cigar-holder etc.) are suddenly flung to the floor, where those that are breakable naturally break into pieces. All this is due to miracles; for this reason the damage caused is made the topic of conversation by people around, usually some time afterwards"[355].

This appeal to miraculous intervention to explain his own clumsiness or contrariness illustrates the extent to which magical, mentalistic thinking can produce bizarre fantasies and severe alienation from reality—something all the more noticeable when the delusions in question lack the fig-leaves of conventional credulity or the vestments of traditional religious belief as they so starkly do in the Schreber case. And by contrast to autistics, whose sense of personal agency is often severely diminished as we saw, agency in paranoiacs sometimes becomes true megalomania. It certainly did in the case of Schreber, who believed that he "became in a way for God the only human being, or simply the human being around whom everything turns, to whom everything that happens must be related and who therefore, from his own point of view, must also relate all things to himself"[356]. Schreber, in other words, was not merely the centre of his own little world, he believed himself to be crucially central to the entire cosmos. Delusions of grandeur seldom get much grander, and megalomania could hardly be much more megalomanic than this!

* * *

We have already seen that you could describe autistics as characteristically *hypo-mentalistic,* or as having a theory of mind ability limited to animals and basic, "desire psychology", rather than fully extended to human beings and mentalistic thinking in general. However, my discussion of the case of Schreber suggests that paranoia in particular and perhaps psychosis in general could be correspondingly seen as characteristically *hyper-mentalistic*—in other words as having too much theory of mind,

[355] Schreber, D.P., *Memoirs of My Nervous Illness.* New York Review Books Classics. 2000, New York: New York Review Books. 455.

[356] Schreber, D.P., *Memoirs of My Nervous Illness.* New York Review Books Classics. 2000, New York: New York Review Books. 455.

and excessive mentalistic tendencies. This in turn would suggest that mentalism as such—the ability to attribute minds to others, and to interpret and understand mental states—is not an all-or-nothing phenomenon of human psychology, but covers a continuum stretching from the extremes of hypo-mentalism in severe autism to hyper-mentalism in cases of psychosis like Schreber's.

At the very least, the concepts of hypo- and hyper-mentalism would neatly explain why autism is a disorder with an invariable onset in childhood, whereas classical schizophrenia is very much an adult-onset (or at the very least, a late adolescent) one. The reason could simply be that no one could develop the characteristic hyper-mentalism of a psychosis without first developing a more normal level of mentalism—evidently something which usually takes the whole of childhood and the greater part of adolescence to achieve. But if autistics are symptomatically hypo- mentalistic, this would imply that they had never completed the normal process of mental development, but stopped short long before at some point in childhood (or perhaps regressed back to it). In any event, autistic symptoms would show in childhood and psychotic ones would not be seen fully developed until later—which is exactly what we find. In other words, here would be the reason why in the past at least people thought of autism only in relation to childhood, and of schizophrenia and other psychoses mainly in relation to adulthood.

Rupert Sheldrake's concept of what he calls "the extended mind" is another instance of what I would prefer to term hyper-mentalism. According to him, "Our minds are extended into the world around us, linking us to everything we see." This leads him to believe that "unexplained human abilities such as telepathy, the sense of being stared at and premonition are not paranormal but normal, part of our biological nature. ... Instead of thinking of minds as confined to brains, he suggests that "they involve extended fields of influence that stretch out far beyond brains and bodies" giving credence to reports of remote viewing, psychic spying and clairvoyance[357]. He adds that in another of his books, *Dogs That Know When Their Owners Are Coming Home,* he showed that these unexplained powers are widely distributed in the animal kingdom. Such extensions of mental activity to other species, and such belief in "mental fields" extending out from the mind in time and space eminently portray the concept of hyper-mentalism as clearly as the behaviourist's denial of the mind illustrates that of anti-mentalism (see above pp. xx-xx). Indeed, as schools of psychology, behaviourism and parapsychology stand at opposite ends on the continuum of mentalism: behaviourism at its hypo-mentalistic extreme and parapsychology at its hyper-mentalistic one.

Furthermore, you could see religion along with magic and superstitious thinking in general as the normal, socially-acceptable expression of hyper-mentalism in human culture. Magic invites credulity for miracles and supernatural intervention in the form of the belief that prayers, rituals, or spells can affect physical reality and bring about

[357] Sheldrake, R., *The Sense of Being Stared At and Other Aspects of the Extended Mind.* 2003, London: Hutchinson. 372.

the fulfilment of wishes—or in other words, that mere mental factors such as intentions and words can change the real world. Superstition is based on the belief that things are not what they seem, and that behind apparent chance events or manifest appearances lurks a deeper, more psychologically-significant reality that can be interpreted in typical mentalistic terms like intention, meaning, guilt, or justice. Fundamental to religion and magic is the belief that beyond the purely physical, tangible, and mundane there is a different, higher, or parallel reality which believers would call "spiritual", "supernatural," or "extra-sensory". All such thinking goes beyond the immediate appearance of the physical world and attributes souls, spirits, essences, or other mental realities to the universe, and there is always an occult but psychologically-perceived truth beyond the immediately-obvious perceptions of the senses.

Religion applies mentalistic thinking to the world and maintains that beyond immediate appearances life has a moral and ethical dimension often represented in divine judgement and retribution in an after-life, heaven, or hell. As a result, reality as a whole—and not just social reality—becomes peopled with divine agents who can be influenced in mentalistic ways analogous to those in which ordinary humans can be: through supplication (prayer), flattery (praise), generosity (sacrifice), apology (confession), restitution (penance), personal visitation (pilgrimage) and lobbying (intercession via saints, angels, and other deities). Accommodation for deities is provided in temples, and entertainment added in the form of sacred music, dramas, and precessions. Indeed, some religions even claim to have quasi-legal, mutually- binding contracts with their deity, such as the Old and New Covenants of Judaism and Christianity respectively—and several regard God as the author of their sacred book and guarantor of their claims to territorial sovereignty and racial integrity. In this way, all manner of personal and collective fears, failings, and frustrations beyond the remedy of mere mortals can be redressed, and a mentalistic adaptation could become the foundation for the evolution of religion. As Schreber perceptively commented, "the legends and poetry of all peoples literally swarm with the activities of ghosts, elves, goblins, etc., and it seems ... nonsensical to assume that in all of them one is dealing simply with deliberate inventions of human imagination without any foundation in real fact"[358].

In his *Natural History of Religion* David Hume (1711-76) observed that

There is an universal tendency among mankind to conceive all beings like themselves, and to transfer to every object, those qualities, with which they are familiarly acquainted, and of which they are intimately conscious. We find human faces in the moon, armies in the clouds; and by a natural propensity, if not corrected by experience and reflection, ascribe malice or good-will to every thing, that hurts or pleases us. Hence... trees, mountains and streams are personified, and the inanimate parts of nature acquire sentiment and passion.[359]

[358] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

[359] Guthrie, S., *Faces in the Clouds: A New Theory of Religion*. 1993, Oxford: Oxford University Press. 290.

Indeed, Hume adds that even "philosophers cannot exempt themselves from this natural frailty; but have often ascribed. to inanimate matter the horror of a *vacuum*, sympathies, antipathies, and other affections of human nature"[360]. Much more recently, the primate researcher, Daniel Povinelli commented that "For over three centuries, philosophers and scientists alike have, to greater and lesser degrees, assumed that when we see animals behave in ways that look very similar to ours, they must be thinking in ways that are similar to ours"[361], and nowhere is this more true than in relation to our nearest primate relative, the chimpanzee. But following a long series of carefully controlled experiments carried out with exemplary scientific method Povinelli concludes that chimpanzees do not interpret the pointing-like gestures of themselves or others in the manner that we do; that although they are quite sensitive to the behaviour of others, chimpanzees do not interpret behaviour in mentalistic terms; and that chimpanzees do not draw on underlying intentions in judgements of accidental as opposed to deliberate actions. Furthermore, he concludes that chimpanzees are unable to represent others as agents with false beliefs: what we have already seen has been called "the acid test of theory of mind" (see above pp. xx- xx). In other words, Povinelli concludes that chimpanzees have evolved neither what I have termed mechanistic nor mentalistic cognition as they are found in human beings. These, in his view, add up to "a specialization of the human species—a specialization that was woven into our brain right alongside a much older set of psychological systems, leaving us in the awkward position of being uncertain about which mechanisms are at work at any given time"[362].

But however that may be, the question remains of why human beings should so compulsively and routinely mentalize nature. A recent suggestion is that "We see apparent people everywhere because it is vital to see actual people wherever they may be." And not just people: "it is better for a hiker to mistake a boulder for a bear than to mistake a bear for a boulder"[363]. In other words, to the extent that hyper- mentalism means attributing human-like minds to objects or organisms that in reality lack them, it is entirely normal, and the occasional false alarms, so to speak, are more than compensated for by the importance of not missing a real occurrence:

when we see something as alive and humanlike, we can take precautions. If we see it as alive we can, for example, stalk it or flee. If we see it as humanlike, we can try to establish a social relationship. If it turns out not to be alive or humanlike we usually

[360] Guthrie, S., *Faces in the Clouds: A New Theory of Religion.* 1993, Oxford: Oxford University Press. 290.

[361] Povinelli, D.J., *Folk Physics for Apes: The Chimpanzee's Theory of How the World Works.* 2000, Oxford: Oxford University Press. 391.

[362] Povinelli, D.J., *Folk Physics for Apes: The Chimpanzee's Theory of How the World Works.* 2000, Oxford: Oxford University Press. 391.

[363] Guthrie, S., *Faces in the Clouds: A New Theory of Religion.* 1993, Oxford: Oxford University Press. 290.

lose little by having thought it was. This practice thus yields more in occasional big successes than it costs in frequent little failures. In short, . "better safe than sorry."[364]

Exactly the same reasoning explains other pathological mental states such as anxiety attacks or phobias. In these cases too, the better-safe-than-sorry principle applies and explains why, even though there may be so many false alarms, the fear/phobia system is nevertheless more useful if set for too much sensitivity than it would be if set for too little. For some individuals at the extreme end of the sensitivity setting this may mean chronic, disabling anxiety or irrational phobias, and much the same could be true of mentalism. It may be that paranoid schizophrenics like Schreber represent only the extreme end of a normal distribution, with everyone having some tendency to over-mentalize in some situations but few taking it to such lengths as he did. Mentalism, in other words, like anxiety or phobias, may be a naturally-selected tendency that would only become pathological in cases like Schreber's where it far exceeded its normal bounds. And if anyone wanted to know why natural selection should have endowed human beings with such supernumerary mentalism, so to speak, they have only to consider the plight of autistics to see what happens to those without it.

But the mention of autism reminds us that if paranoiacs like Schreber are hyper-mentalistic in this respect, autistics ought to show the opposite tendency and be much less likely to believe in magic and religion. Certainly, the issue of autistics' attitude to religion and belief in God is also raised by the case of Hugh Blair of Borgue mentioned earlier (see above pp. xx-xx). In their retrospective analysis of the legal proceedings which provide much of the evidence on which the diagnosis of Blair's autism is based, Houston and Frith comment that "It follows that a lack of theory of mind restricts a religious sense... For this reason the question posed by the judges: 'Did Hugh Blair have a sense of God?' can be interpreted as analogous to the question posed by modern psychologists: 'Did Hugh Blair have a theory of mind?'" Their answer:

Clearly, the behavioural signs suggested that Hugh appreciated religious feelings and participated in the proper religious activities. Nevertheless, the final verdict of the court implies that the judges did not believe that Hugh had the same sense of God as other members of the community. This matches our interpretation of Hugh having a diminished awareness of mental states.[365]

Up to the present, there have not been any systematic studies of autistics' religious feelings or beliefs, but one paper has been published which considered the evidence in autobiographical accounts like those I quoted in the last chapter. The author concludes that

One gets the distinct impression by reading such descriptions that religion in autism consists of entirely different processes than the normative experience. Namely, in these passages, God, the sine qua non of Western religious experience, is perceived more as a

[364] Guthrie, S., *Faces in the Clouds: A New Theory of Religion*. 1993, Oxford: Oxford University Press. 290.

[365] Houston, R. and U. Frith, *Autism in History: The Case of Hugh Blair of Borgue*. 2000, Oxford: Blackwell. 207.

principle than as a rich psychological agent. God is perceived as a force in the universe that is directly responsible for the organization of cosmic structure— arranging matter in an orderly fashion or treating entropy—or has been reduced to the conceptualisation of scientific logic altogether.[366]

She adds that "What is noticeably absent in the autistic accounts is a sense of interpersonal relations between the worshipper and the deity, a sense of emotional dependency on an intentional agent who has control over the experiences and existence of the individual." She concludes,

Because people with autistic spectrum disorders have difficulty interpreting the meaning attached to social behavior and therefore probably cannot rely on a theory of mind to explain their experiences, their religious beliefs cannot affix to core representations of psychological agency. The religious beliefs of people with autism could therefore be envisioned as sliding into conceptual slots provided by the folk physics system, even those, such as supernatural agent concepts, that are traditionally relegated to the slots of the folk psychology system. Thus supernatural agents, such as God, are perceived as behavioral rather than intentional agents.[367]

Indeed, the mother with two autistic sons who I have cited before remarked that her boys "don't turn to God as a way of navigating life's difficulties", adding that when one of them "was (inappropriately) attending a mainstream primary school, his report simply said, 'Religious Knowledge: not applicable'"[368].

Autistics' religion, in other words, is generally speaking more mechanistic and less mentalistic than that of normal believers. Nevertheless, the question of superstition still remains. Surely, this is highly mentalistic, and not something you would expect to find in autistics—at least if a deficit in theory of mind is believed to underlie many of the symptoms of the disorder? Nevertheless, the fact that no less a behaviourist than B. F. Skinner once published a paper entitled, "*Superstition" in the pigeon*[369] suggests that the situation may be more complicated. The irony of this is of course the fact that in this paper—and despite the inverted commas around the word *superstition*—Skinner appears to attribute a highly mentalistic attribute to a laboratory animal which is supposed to lack any kind of mind, at least according to the anti- mentalistic nostrums of behaviourism (see above, pp. xx-xx).

Skinner used the term "superstition" to describe the widely replicated finding that laboratory animals can become spontaneously and accidentally conditioned by otherwise random or freak stimuli that might occur in association with a reward. For example, if a hungry pigeon is placed in a cage and receives a food reward at random intervals unlinked to any particular behaviour, the pigeon is likely to become conditioned to keep repeating whatever it happened to be doing when the first reward

[366] Bering, J.M., *The Existential Theory of Mind.* Review of General Psychology, 2002. **6**(1): p. 3-24.

[367] Bering, J.M., *The Existential Theory of Mind.* Review of General Psychology, 2002. **6**(1): p. 3-24.

[368] Moore, C., *Different connections*, in *Sunday Times*. 2004: London. p. 10.

[369] Skinner, B.F., *'Superstition' in the pigeon.* Journal of Experimental Psychology, 1948. **38**: p. 168-72.

arrived. In other words, this is conditioning similar to that of Pavlov's salivating dogs, and indeed recalls the fact that Pavlov had first noticed the dogs making this conditioned response to the white coats of the lab technicians who came to feed them. The bell came later as a contrived confirmation of the effect, and of course it need not have been a bell: any suitable stimulus would have had the same effect. In the case of the superstitious pigeons a fortuitous activity of the experimental animal itself which just happened to occur when the reward appeared became linked in the animal's mind—behaviourists would say *behaviour*—with the reinforcing reward. And of course, once this apparent link was established and the animal began to repeat the reinforced behaviour more frequently, the more likely would it be to become even further reinforced by subsequent rewards occurring in connection with it. Indeed, Skinner's experiments showed that an interval between reinforcements of about 15 seconds was the optimal one and that one as long as a minute was much less so[370].

It was of course the apparently compulsive repetition of the reinforced behaviour that made Skinner think of *superstition*—along with the fact that the experimenter knew that there was in reality no connection whatsoever between the behaviour and the reward that had occasioned it. Indeed, the superstitious pigeon was so intuitively appealing to audiences that Skinner frequently used it as a classroom demonstration which was—and apparently still is in the words of one authority—"a consistent crowd-pleaser"[371]. In terms of the concepts being developed in the course of this book, you could see the pigeon's superstition as *mechanistic*, rather than mentalistic: it would be purely behaviourally superstitious—superstition without any mental content whatsoever. But equally, whatever could happen in a pigeon in this respect could just as easily—perhaps even more easily—occur in a human being. Indeed, as Skinner himself pointed out

There are many analogies in human behavior. Rituals for changing one's luck at cards are good examples. A few accidental connections between a ritual and favourable consequences suffice to set up and maintain the behavior in spite of many unreinforced instances. The bowler who has released a ball down the alley but continues to behave as if he were controlling it by twisting and turning his arm and shoulder is another case in point. These behaviors have, of course, no real effect upon one's luck or upon a ball half way down an alley, just as in the present case the food would appear as often as it does if the pigeon did nothing—or, more correctly speaking, did something else.[372]

In other words, if a pigeon can exhibit what I would call mechanistic superstition, then so too can a human being, and the sporting or card-playing examples cited im-

[370] Skinner, B.F., *'Superstition' in the pigeon.* Journal of Experimental Psychology, 1948. **38**: p. 168-72.

[371] Vyse, S.A., *Believing in Magic: The Psychology of Superstition.* 1997, New York: Oxford University Press. 257.

[372] Skinner, B.F., *'Superstition' in the pigeon.* Journal of Experimental Psychology, 1948. **38**: p. 168-72.

mediately above underline the mechanistic aspect because they relate to mechanical actions carried out on objects or imagined to influence them. The mother of the two autistic boys I quoted above on the lack of religious feeling in her sons adds that

Autistic children ... don't collude in magic because it involves the use of mentalizing skills they simply don't possess.. To appreciate magic, you need a firm grasp of what's normal, what's expected. Autists, who see the world in disconnected detail rather than as a coherent whole, lack that overview of normality.[373]

To the best of my knowledge, no one has ever investigated the superstitions of autistics in any systematic way, but we have already seen that impressions of their religious beliefs suggest that they fit the pattern we might predict and are less mentalistic and much more mechanistic than normal. Again, we saw in the previous chapter that many autistic people lack a sense of personal agency and as a result fail to connect events that happen around them to their own internal mental states (see above pp. xx-xx). As a result, autistics might be predicted to be even more likely to exhibit superstitious *behaviour* than normal people—or what I would term mechanistic superstition. Indeed, to the extent that an autistic might be severely hypo-mentalistic, they might be as prone to superstitious behaviour as one of Skinner's pigeons.

The reason for this would be that, whereas a normal person might be able to relate events around them to their own and others' motives, knowledge, state of mind, skills, and abilities, an autistic might simply observe them happening without reference to themselves or others, rather as we saw exemplified by the three young men mentioned in the last chapter (see above pp. xx-xx). Lacking an ability to interpret such events in terms of their own or others' mental states, an autistic person might be all the more likely to attribute them to luck, God, or any other arbitrary factor that seemed credible. For example, Uta Frith comments that autistic children often do not understand the difference between justified knowledge and a mere guess, and recounts the following case as an apt illustration:

Milton is an intelligent autistic boy of 12 who took part in our experiments on reading. He read—fluently—selected passages of text and we asked various questions to test his text comprehension and general knowledge. After he had given a particularly good answer we asked him quite casually, "Oh, how did you know that?"

His matter of fact reply was, "By telepathy." We repeated the question on several other occasions, and he always answered in the same way. He never said, "I just read it," or "My teacher told me," or "It's obvious, isn't it?"[374]

Belief in—or perhaps it would be more accurate to say *invocation of*—telepathy, is thus not necessarily evidence of what I am calling hyper-mentalism. In this case it looks more like a convenient excuse, much as a child might explain a mess they had intentionally made as being the result of an "accident". Indeed, high-functioning Asperger's cases in particular might be particularly prone to attribute certain events to

[373] Moore, C., *George and Sam*. 2004, London: Viking. 252.

[374] Frith, U., *Autism: Explaining the Enigma*. 2nd ed. 2003, Oxford: Blackwell. 249.

such external agencies and to try to close the gap, so to speak, between their own minds and those of others by use of socially-accepted symbolism, such as that of conventional religion, traditional superstition, or parapsychology.

A final implication of this line of reasoning is that, if autistics are hypo-mentalistic even when they are religious or superstitious, psychotics might be correspondingly *hypo-mechanistic*. In other words, if there are indeed two parallel cognitive systems—what I am calling mentalistic and mechanistic cognition—and if deficits in mentalism sometimes go with remarkable mechanistic skills in autism, you might wonder to what extent hyper-mentalistic psychotics also tended to show mechanistic deficits. Of course, you could argue that anyone with a tendency to magical ideation and credulity for the supernatural would have to be lacking in a more down-to-earth, mechanistic style of thought, and that to this extent the observation was fairly obvious. But however that may be, there is indeed evidence that schizophrenics and others with milder schizotypical tendencies also have impaired visual-spatial and arithmetic abilities, relative to their verbal abilities. Furthermore there is evidence that carriers of a genetic tendency to psychosis in their near relatives show impairments in verbal memory and in visual and spatial skills. Indeed, a separate study concludes that a relative superiority of verbal to spatial skills—or what I would call mentalistic to mechanistic cognition—represents a cognitive asymmetry characteristic of schizophrenia[375][376].

[375] Toulopoulou, T., et al., *Cognitive performance in presumed obligate carriers for psychosis.* British Journal of Psychiatry, 2006. **187**: p. 284-5.

[376] Kravariti, E., et al., *Intellectual asymmetry and genetic liability in first-degree relatives of probands with schizophrenia.* British Journal of Psychiatry, 2006. **188**: p. 186-187.

5. Selfish Genes and the Battle of the Sexes in the Brain

If human beings ever established contact with aliens, the question would immediately arise: how do they see us? Once we had got over the shock of knowing that we were not the only intelligent beings in the universe, we would inevitably see the alien consciousness as a mirror reflecting back a uniquely new and different view of ourselves. We might not like it, but we would have to know what it was because it would represent the only opportunity our species ever had to see itself totally objectively: literally as other intelligences would see us. And of course, such an extraterrestrial view of human nature might reveal fascinatingly original insights into things about ourselves which we would otherwise never have noticed.

Obviously, this is just science-fiction, but with the parallel with autism in mind, we could nevertheless make one or two very well founded predictions about how such an alien view might portray us. We have already noted that extra-terrestrials could be counted on not to share human vanity about our place in nature, and so might see our species as just one among many (see above pp. xx-xx). In all probability (and particularly if they were a DNA-based species like all those on Earth) the aliens would have already taken what is often called *the selfish gene* view of life after the title of the well known book by Richard Dawkins[377].

The Selfish Gene is a popular-science account in large part based on the insights of the person who many would see as the Darwin of the twentieth century, William D. Hamilton (1936-2000). Anticipating my distinction between mentalistic and mechanistic styles of thought, Hamilton made a telling discrimination between what he called *people people* as opposed to *things people*. He observed that "people people just need people to interact with, not necessarily the understanding of them: They tend to be conformist and are seldom more than superficially critical of any ethos of their time"[378]. But Hamilton himself was obviously one of the things people. Indeed, he described himself as "almost idiot savant" and rated himself "fairly good at woodwork as at other handicrafts" to the extent of having carpentry as a "reserve life plan" in

[377] Dawkins, R., *The Selfish Gene*. Second ed. 1989, Oxford: Oxford University Press.

[378] Hamilton, W.D., *Narrow Roads of Gene Land: Last Words*. The Collected Papers of W. D. Hamilton. Vol. 3. 2005, Oxford: W. H. Freeman/Spektrum.

case his theory proved un-publishable[379][380]. Like the Unabomber—who as we saw was also a skilled woodworker—Hamilton experimented with explosives as a child, in his case losing parts of three fingers and gaining some pieces of shrapnel permanently lodged in his lungs. And like Temple Grandin—who as we have also seen was another keen if frustrated carpenter (see above pp. xx-xx)—Hamilton had a family background which also conformed to the typical pattern of someone with autistic tendencies: his father was a well-known engineer (designer of the Callender-Hamilton bridge) and was followed into engineering by one of Hamilton's brothers, while a geriatrician sister had mechanical skills to the extent that she developed an improved pressure mattress for the treatment of bed sores[381].

Hamilton also described himself as possessing "notably a trait approaching to autism about what most regard as the higher attributes of our species". He went on to portray himself as "a person who ... believes he understands the human species in many ways better than anyone and yet who manifestly doesn't understand in any practical way how the human world works—neither how he himself fits in and nor, it seems, the conventions." Indeed, he added that "It is known now how autists, for all that they cannot do in the way of human relationships, detect better out of confusing minimal sketches on paper the true, physical 3-D objects an artist worked from, than do ordinary un-handicapped socialites." He concluded—evidently with himself in mind—that "so may some kinds of autists, unaffected by all the propaganda they have failed to hear, see further into the true shapes that underlie social phenomena"[382]

What Hamilton saw underlying social phenomena was to become the foundation for modern Darwinism and the revolution in thinking associated with Sociobiology and Evolutionary Psychology. Dawkins's selfish gene metaphor expressed Hamilton's realization that, from the ultimate point of view of evolution, organisms are the vehicles—or bio-degradable packaging—of their genes. Those organisms that deliver their genes safely copied into future generations have been selected, those which fail have not: evolution is as simple as that.

The selfish gene view, if we may call it that, is self-evidently mechanistic to the extent that it makes the transmission of genes the ultimate factor in evolution. People often misunderstand it to think that Hamilton's essential insight also puts genes in the driving seat, so to speak, but the truth is that organisms which move need brains to control their movement because genes as such could never do it on their own. Another analogy is to see organisms as acting as the *agents* of their genes. Looked at from

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[379] Hamilton, W.D., *Narrow Roads of Gene Land: The Evolution of Sex*. The Collected Papers of W. D. Hamilton. Vol. 2. 2001, Oxford: W. H. Freeman/Spektrum. 872.

[380] Hamilton, W.D., *Narrow Roads of Gene Land: Evolution of Social Behaviour*. The Collected Papers of W. D. Hamilton. Vol. 1. 1996, Oxford: W. H. Freeman/Spektrum. 552.

[381] Bliss, M.R. *In Memory of Bill Hamilton: Hazards of Modern Medicine*. in *Origin of HIV and Emerging Persistent Viruses*. 2001. Accademia Nazionale dei Lincei, Rome.

[382] Hamilton, W.D., *Narrow Roads of Gene Land: The Evolution of Sex*. The Collected Papers of W. D. Hamilton. Vol. 2. 2001, Oxford: W. H. Freeman/Spektrum. 872.

this perspective, genes build bodies and brains to act for and on behalf of them. But they have to give those agents the necessary independence and expertise they need to complete their mission. In the human case, mentalistic skills are foremost among the expertise that people need, and as we saw in the last chapter, endow us with real freedom of choice in situations where one person's actions are constrained by another person's beliefs about them (see above pp. xx-xx). Genes alone could not solve the difficult problems that such complex situations pose, and so they build brains with mentalistic and mechanistic abilities to solve the problems for them. Like passengers on a plane, genes sit quietly in their sex-cell precursor seats and leave it to the aircrew on the cerebral flight-deck to do the skilful part by delivering them safely to their destination: the next generation(383).

Evolution could probably be counted on to act this way anywhere in the universe, suggesting that an alien intelligence would also see itself this way. In this chapter I want to take a look at autism and psychosis from this unusual point of view. As we shall now see, it is one which reveals some astonishing insights, not only into the most bizarre of all Schreber's delusions, but also into the genetic logic that appears to underlie both autism and psychosis and to explain the strange symptoms of each.[1]

* * *

With Hamilton's words about discerning underlying patterns quoted above in mind, we might return to the last chapter and, looking at things autistically so to speak, note that a remarkable pattern has begun to emerge. We saw that many of the most striking symptoms of psychotic illnesses like paranoid schizophrenia could be seen as the exact opposite of those seen in autism. The clear implication is that, rather than being totally unconnected, autism and psychosis now begin to look as if they could represent poles of a continuum of mentalism stretching from the extreme hypo- mentalism of autistic mind-blindness to the bizarre hyper-mentalism of paranoid psychotics like Schreber.

A further notable antithesis which I have not mentioned so far is in relation to reading. *Dyslexia* describes difficulty in learning to read despite adequate intelligence and opportunity, and is found in about 1-in-20 primary-school age children, with a prevalence in boys about four times that in girls. As many as 70-80 per cent of schizophrenics were found to exhibit a significant number of dyslexic language traits in one study, and the neuro-anatomical and cognitive correlates of dyslexia are similar to those found in both schizophrenia and schizotypal personality disorder [Crespi, In preparation #1909]. *Hyperlexia* is essentially the opposite of dyslexia. The term describes the spontaneous and precocious mastery of reading in children, usually before the age of three, and in conjunction with impairments of verbal communication. Hyperlexics typically can read more or less anything, but cannot necessarily understand what they are reading. Hyperlexia is a rare condition, found almost exclusively in conjunction with autism,

[1] In what follows I am deeply indebted to my fellow researcher and co-author, Bernard Crespi, whose work in evolutionary genetics is very much a continuation of the tradition established by Hamilton.

(383) Badcock, C.R., *Evolutionary Psychology: a critical introduction.* 2000, Cambridge: Polity Press.

and we have already encountered one famous hyperlexic in the person of Kim Peek, the savant role-model for the film *Rainman* (see above pp. xx-xx). Like Kim Peek, hyperlexic children often show significant impairments in reading comprehension, especially in relation to the more mentalistic aspects of langue, such irony, metaphor, or humour. Indeed, to the extent that reading words is a purely mechanistic skill now performed by computers but that understanding what they mean is a mentalistic one only fully developed in normal human beings, you could see hyperlexia as representing an extreme of the pattern of preserved mechanistic but impaired mentalistic cognition seen in autism as a whole. And as this association would lead you to expect, hyperlexic children show enhanced visual-spatial abilities like those typically found associated with autism[Crespi, In preparation #1909]. In other words, whereas autistics are sometimes hyperlexic, schizophrenics are more likely to be dyslexic: another diametrically-opposed set of symptoms to add to the list (see table 5.1).

Autism/Asperger's syndrome
|
Psychosis/Paranoid schizophrenia
|
gaze-monitoring deficits
|
delusions of being watched/spied on
|
apparent deafness/insensitivity to voices
|
hallucination of and hyper-sensitivity to voices
|
intentionality deficits
|
erotomania/delusions of persecution
|
shared-attention deficits
|
delusions of conspiracy
|
theory of mind deficits
|
magical ideation/delusions of reference
|
deficit in personal agency/episodic memory
|
megalomania/delusions of grandeur
|
literalness/inability to deceive

|
delusional self-deception
|
early onset
|
adult onset
|
hyper-mechanistic: visual/spatial skills
|
hypo-mechanistic: visual/spatial deficits
|
some hyperlexic
|
some dyslexic
|
local brain over-connectivity with global underconnectivity
|
local brain under-connectivity with global over -connectivity
|

Table 5.1: Diametrically different symptoms in autism and psychosis

Certainly, the association of dyslexia with schizophrenia, and hyperlexia with autism along with all the other symptoms listed here, provides striking support for the theory that psychosis and autism represent opposite disorders arrayed on a continuous mentalistic spectrum. Like autism, dyslexia is a highly heritable trait, and genome scans have provided strong evidence for the involvement of sites on chromosomes 2, 6, 7, 13, and 18. Dyslexia has also been noted in three of four children from the same family with a maternal duplication of part of chromosome 15, and the South Carolina Autism Project found abnormalities in the same region to be the most important common feature in the first hundred cases it studied[384]. Furthermore, this same stretch of chromosome 15 has been found to be implicated in two other developmental disorders whose symptoms overlap both autism and psychosis.

Prader-Willi syndrome affects about 1 in 15,000 births, and is caused by the loss or silencing of genes inherited from the father on chromosome 15 through receiving both copies of this chromosome from the mother, or losing part of the paternal copy[385]. Symptoms listed include lack of appetite, poor suckling ability, a weak cry, inactivity

[384] Schroer, R.J., *Autism and Maternally Derived Aberrations of Chromosome 15q.* American Jounal of Medical Genetics, 1998. **76**: p. 327-336.

[385] Nicholls, R.D., S. Saitoh, and B. Horsthemke, *Imprinting in Prader-Willi and Angelman syndromes.* Trends in Genetics, 1998. **14**(5): p. 194-200.

and sleepiness, high pain threshold, and reduced tendency to vomit[386]. By contrast to Prader-Willi, in *Angelman syndrome* only the paternal chromosome 15 is present in its entirety, and the critical maternal genes involved in Prader-Willi syndrome are missing[387]. Symptoms include prolonged suckling, hyper-activity and frequent waking.

Although both Prader-Willi and Angelman children are retarded, Angelman retardation is usually much more severe, and—as in the most severe cases of autism—speech is absent. In the case of Prader-Willi children, however, exceptional skill at jigsaw puzzles has been listed as a diagnostic feature[388]. Whereas Prader-Willi patients have a high pain threshold (and often damage themselves as a result),

Angelman patients have a low pleasure threshold to the extent that frequent paroxysms of laughter is listed as a major diagnostic feature and the condition is sometimes known as Happy Puppet Syndrome[389]. Again, whereas Prader-Willi children with two copies of their mother's chromosome 15 tend to be diagnosed as psychotic, Angelman cases are much more likely to be diagnosed as autistic in their behaviour and are more severely retarded (often having no language)[390]. Indeed, there is a striking contrast where appetite is concerned: Prader-Willi children, although poor sucklers at first, become indiscriminate and uncontrollable foragers for food, and obese as a result[391]. This poses a sharp contrast to the norm in autism, where remarkably fastidious food preferences are often found, and the outcome is more likely to be some measure of malnutrition—seldom obesity. The striking antithesis between the symptoms of autism and psychosis set out in table 5.1 recalls the case of Prader-Willi and Angelman syndromes set out in table 5.2 and suggests the possibility that something similar may underlie both.

Angelman syndrome
|
Prader-Willi syndrome
|
prolonged suckling
|
poor suckling

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[386] Franke, U., J.A. Kerns, and J. Giacalone, *The SNRPN gene Prader-Willi syndrome*, in *Genomic imprinting: causes and consequences*, R. Ohlsson, K. Hall, and M. Ritzen, Editors. 1995, Cambridge University Press: Cambridge. p. 309-21.

[387] Nicholls, R.D., S. Saitoh, and B. Horsthemke, *Imprinting in Prader-Willi and Angelman syndromes.* Trends in Genetics, 1998. **14**(5): p. 194-200.

[388] Holm, V.A., et al., *Prader-Willi Syndrome: Consensus Diagnostic Criteria.* Pediatrics, 1993. **91**(2): p. 398-402.

[389] Angelman, H., *'Puppet' Children: A Report on Three Cases.* Developmental Medicine and Child Neurology, 1965. **7**: p. 681-688.

[390] Cook, E.H.J., et al., *Autism or Atypical Autism in Maternally but Not Paternally Derived Proximal 15q Duplication.* American Jounal of Human Genetics, 1997. **60**(4): p. 928-34.

[391] Haig, D. and R. Wharton, *Prader-Willi syndrome and the evolution of human childhood.* American Journal of Human Biology, 2003. **15**: p. 320-9.

|
frequent crying
|
weak crying
|
hyper-active/sleepless
|
inactive/sleepy
|
low pleasure threshold
|
high pain threshold
|
sever retardation: no language
|
exceptional skill at jig-saw puzzles
|
tendency to autism
|
tendency to psychosis
|

Table 5.2: Diametrically different symptoms of Angelman and Prader-Willi syndromes

Even though a child inherits half its DNA from each parent, we now know that certain genes are only expressed if they come from one parent rather than the other. A gene called *IGF2* codes for a growth hormone (insulin-like growth factor 2), and is only normally expressed from the father's gene. If the mother's *IGF2* gene is also expressed *Beckwith-Wiedemann syndrome* results. Beckwith-Wiedemann babies are one-and-a-half times normal birth-weight and show excessive growth during adolescence along with other over-growth symptoms, such as tumours. Normally the mother's copy of the *IGF2* gene is silenced, or *imprinted*. But if both copies of this gene are silenced, the result is the opposite: the pre- and post-natal growth retardation of *Silver-Russell syndrome*.

Despite being relatively few in number—about one per cent of the total—imprinted genes are critical for a number of different reasons. First, imprinted genes play a strategic role in development, effectively controlling many other genes down-stream of them in the developmental cascade, or having consequences which resonate throughout the organism. *IGF2* illustrates both, having growth effects on the whole body by way of coding for a growth hormone, but also making its non-imprinted cousin *IGF1* act as if it were imprinted[392]. Second, most imprinted genes are expressed in the placenta

[392] Cattanach, B.M., C.V. Beechey, and J. Peters, *Interactions Between Imprinting Effects in the*

and the brain, where as we shall see in greater detail below they have far-reaching and often life-long effects on growth, development, and behaviour. Third, imprinted genes are more prone to mutation than others, and uniquely can transmit environmentally-induced changes across generations thanks to effects of the imprinting mechanism. Fourth, imprinted genes are only expressed from one copy, effectively meaning that they have a monopoly effect which the second copy of non-imprinted genes would normally frustrate. This can be bad news if the uniquely-expressed copy of an imprinted gene is defective. But this can cut both ways: a beneficial mutation on such a gene will not be diluted by a second, less beneficial copy. The effect of this is to expose such mutations to immediate selection, without the complications introduced by the backup. And as the case of *IGF2* again illustrates, imprinting means that alterations in the expression of such genes can cause both complete loss of function (as in Silver-Read syndrome), or doubling of function (as in Beckwith-Wiedemann syndrome). In other words, along with just the right amount of something, imprinted genes can cause twice as much, or none at all! Finally, because all mothers are female and all fathers are male, maternally- and paternally-active genes interact critically with genes which are differently expressed in each sex and with genes on sex chromosomes, however they are expressed. Indeed, we shall see in a moment that X chromosome genes can mimic the effect of imprinted ones [Crespi, in preparation #1975].

In the case of *IGF2*, the underlying logic of the pattern of imprinting reflects the contrasting costs and benefits of growth to the mother as opposed to the father. Larger size is normally advantageous to mammals (at least when it falls within the normal range), and in the case of human beings, larger babies live longer, suffer less disease, and have better all-round health; while coronary heart disease, stroke, and non-insulin dependent diabetes are associated with low birth-weight[393]. Taller men do better in most occupations, are preferred by women, and have more sexual partners and children than shorter ones[394] Although the mother's genes in her children benefit from their growth to exactly the same extent as the father's, only the mother pays the cost. In the tangible terms of a child's birth-weight, the mother's contribution is hundreds of billions of times greater than the father's, which is only a single sperm! Intangible costs are much the same: in modern sub-Saharan Africa, a woman has a 1- in-21 lifetime risk of death from pregnancy, childbirth, or abortion. And although the risk for a Western woman is about 1-in-10,000, the risk for men everywhere and throughout history has been exactly zero[395]. However you look at it, a mother's obligatory biological investment in her offspring exceeds that of the father by amounts which seem more astronomical than biological.

Mouse. Genetics, 2004. **168**: p. 397-413.

[393] Barker, D.J.P., *Mothers, Babies and Health in Later Life.* 2nd ed. 1998, Edinburgh: Churchill Livingstone. 217.

[394] Pawlowski, B., R. Dunbar, and A. Lipowicz, *Tall men have more reproductive success.* Nature, 2000. **403**: p. 156.

[395] Potts, M. and R. Short, *Ever Since Eve: The evolution of human sexuality.* 1999, Cambridge:

As a result, paternally-active genes favour growth much more than maternally-active ones, and are particularly strongly expressed in the placenta—an organ primarily designed to extract resources from the mother. Indeed, an abnormal conceptus with a double set of paternal genes without any genes whatsoever from the mother results in a massive proliferation of the placenta without any associated foetus[396]. The human placenta is the most invasive of all mammalian placentas, and in some cases can perforate the uterus, killing the mother. The fact that anaemic mothers have heavier placentas than non-anaemic ones despite giving birth to lower-weight babies suggests that the placenta can actively respond to deficits in the mother's provision of nutrients by becoming larger. Cells originating in the placenta aggressively widen the mother's arteries that feed it by breaking down their walls and weakening them, so that they sag and distend, thereby increasing blood supply to the cavities that the placenta excavates to receive it. Fine, tree-like capillaries fill these spaces and directly absorb nutrients from the mother's blood and return wastes to it. Paternally-active genes in the foetus/placenta also drive up the mother's blood pressure and blood-sugar levels to the benefit of the foetus, but also with potentially serious long-term consequences for the mother's health—selfish genes indeed[397]!

Conflict between maternal and paternal genes can continue after birth. Certainly, you could see the prolonged suckling, hyper-activity, and frequent waking of Angelman syndrome as embodying every mother's worst fear, and not coincidentally associated with paternally-expressed genes. The suppression of paternal and the enhancement of maternal genes in Prader-Willi children, on the other hand, could be seen as explaining why, despite being seriously retarded, these children make much less demand on the mother thanks to their lethargy, sleepiness, weak cry, and poor suckling. Indeed, even the indiscriminate food-foraging and obesity of older Prader- Willi children can be seen to conform to this interpretation. This is because, when these traits evolved in primal hunter-gather pre-history, they would have made children more independent of the mother's resources (principally breast-milk) and more likely to survive periods of prolonged neglect by her thanks to their fat reserves[398]. And in any event, Angelman and Prader-Willi syndromes graphically illustrate the point I made earlier about the potentially contradictory effects of imprinted genes: failures can result in everything or nothing, with the critical something poised precariously in between[399].

Although the genetic basis of both autism and psychosis remained unknown at the time of writing, the last observation suggests an intriguing possibility. This is that autism and psychotic illnesses such as schizophrenia may be related to faulty genomic

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Cambridge University Press. 358.

[396] Newton, G., *The case of the biparental mole*, in *Wellcome News*. 2001. p. 1819.

[397] Haig, D., *Genetic Conflicts of Pregnancy and Childhood*, in *Evolution in Health and Disease*, S.C. Stearns, Editor. 1999, Oxford University Press: Oxford. p. 77-90.

[398] Haig, D. and R. Wharton, *Prader-Willi syndrome and the evolution of human childhood.* American Journal of Human Biology, 2003. **15**: p. 320-9.

[399] Badcock, C.R., *Evolutionary Psychology: a critical introduction*. 2000, Cambridge: Polity Press.

imprinting and that autism in particular might be not so much an extreme male brain disorder so much as one of an extreme *paternal brain*. Excepting the placenta, most imprinted genes are expressed in the brain, and in mice there is arresting evidence that maternally- and paternally-expressed genes play very different roles in braindevelopment. This is because it is now possible to produce mice in the laboratory which express mainly the father's or the mother's genes, and to stain cells in such a way that you can see exactly where the paternal or maternal genes are going in the developing body. The result is striking: foetal mice with a father but no mother are larger than normal and have a bigger placenta but reduced brains; those with a mother and no father are the opposite—they are smaller than usual, have reduced placentas, but have larger brains than normal[400]. Of course, you could not carry out such an experiment on human foetuses, but naturally-occurring human equivalents mirror these findings. Abnormal human foetuses with a double set of the mother's genes and one of the father's (rather than a single set from each parent) are small except for the head, show a retardation of growth, and have small placentas. By contrast, those with a double set of their father's genes and a single set of the mother's are well grown except for the head and have a large placenta[401][402][403][404].

In mice, cells with only maternal genes are found in large numbers in the cerebral cortex (and the underlying striatum) and in the fore-brain, but very few are found in the lower brain—especially in the hypothalamus (of which, more in a moment). This is true both of mature, fully-grown mice but even more so of foetuses, where there is a complete absence of maternal cells in the hypothalamus. In both cases, mother-only cells are found to be particularly clustered in the frontal lobes of the cortex. Father-only cells, by contrast, are the exact opposite: these are found in the hypothalamus and lower brain, but not in the cerebral cortex. The few that are found in the forebrain tissue of embryos do not proliferate and are subsequently eliminated. However, no such difference is found in the brain-stem, which appears to be equally the work of maternal and paternal genes[405].

In human beings, the *hypothalamus* is concerned with basic drives and appetites such as hunger, thirst, sex, and aggression, and with emotional responses such as pleasure, pain, and fear. Consequently, some kind of developmental defect in the hypothalamus

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[400] Keverne, E.B., et al., *Genomic Imprinting and the Differential Roles of Parental Genomes in Brain Development.* Developmental Brain Research, 1996. **92**: p. 91-100.

[401] Newton, G., *The case of the biparental mole*, in *Wellcome News*. 2001. p. 1819.

[402] Haig, D., *Genetic Conflicts of Pregnancy and Childhood*, in *Evolution in Health and Disease*, S.C. Stearns, Editor. 1999, Oxford University Press: Oxford. p. 77-90.

[403] Keverne, E.B., et al., *Genomic Imprinting and the Differential Roles of Parental Genomes in Brain Development.* Developmental Brain Research, 1996. **92**: p. 91-100.

[404] Hannah, J., et al., *A global disorder of imprinting in the human female germ line.* Nature, 2002. **416**: p. 539 - 542.

[405] Allen, N.D., et al., *Distribution of parthenogenetic cells in the mouse brain and their influence on brain development and behavior.* Proceedings of the National Academy of Sciences, USA, 1995. **92**(11/95): p. 10782-10786.

was suspected in Prader-Willi and Angelman syndromes from the beginning (Franke, Kerns et al. 1995). The hypothalamus also regulates the production of pituitary growth hormones, which along with adrenal, thyroid, and sex hormones, either directly or indirectly controls growth. The pituitary is sometimes called "the master endocrine gland" of the body, but is itself under the control of the hypothalamus, both neurologically and chemically. Neurologically, the posterior pituitary is just a part of the hypothalamus that protrudes from the brain and is not a gland in its own right[406].

From this point of view, you could see the hypothalamus as performing a role in the brain analogous to that of *IGF2* in the genome. Like *IGF2*, the hypothalamus is concerned with growth and consumption of resources and, again like it, mammalian mothers appear to place imprints on the genes that build it, just as they do the *IGF2* gene. Presumably this is because imprinting these genes limits the growth that would result if the genes for building the hypothalamus from both parents were expressed. Cells in the embryonic hypothalamus are critical for later development, and the sizes of its cell populations in the foetus could provide a prediction of subsequent neurohormonal activity during later life[407]. In other words, imprinted genes that control the growth of nerve cells in the development of the foetal brain could indirectly determine body size: according to this way of looking at it, fathers would want more, but mothers would want less.

But what of the neo-cortex, and why should maternal genes be preferentially expressed there? An obvious suggestion is the finding to which I have already alluded that the pre-frontal part of the neo-cortex is critically concerned with impulse-control and inhibition of lower centres, such as the hypothalamus. As I mentioned in an earlier chapter, frontal brain volumes have been claimed to be larger in women, and reduced frontal volume is definitely associated with antisocial behaviour and psychopathy[408]. And as we also saw, damage to or experimental blocking of these areas can occasionally produce autism-like features in otherwise normal people (see above pp. xx-xx).

If maternal genes are exclusively expressed in the pre-frontal cortex we might be justified in thinking of it as the *maternal* brain. If so, then we could see the hypothalamus and other parts of the lower brain as *paternal* for parallel reasons: paternal genes are mainly expressed there. Furthermore, we can now begin to see that the relation between the two is reminiscent of that between paternally-active and maternally-active genes. As I pointed out earlier, the paternal brain could be seen as serving the father's genetic interest in the offspring's growth and consumption of resources, but as we can also now see, the maternal brain—and the pre-frontal cortex in particular—could

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[406] Thomson, R.F., *The Brain: An Introduction to Neuroscience*. 1985, New York: W. H. Freeman. 363.

[407] Deacon, T.W., *Problems of Ontogeny and Phylogeny in Brain-Size Evolution.* International Journal of Primatology, 1990. **11**(3): p. 237-82.

[408] Gur, R.C., et al., *Sex Difference in Temporo-limbic and Frontal Brain Volumes of Healthy Adults.* Journal of the Cerebral Cortex, 2002. **12**: p. 998.

equally be seen as serving maternal genetic self-interest to the extent that it is able to inhibit, control, and contain the paternal brain.

Because the mother's genes are equally present in all her offspring, her genetic selfinterest is best served by co-operation and family unity. Any net benefit from social behaviour among her offspring is also a benefit to the ultimate reproductive success of her genes invested in all of them. Thanks to gestation and lactation, the mother is biologically the prime nurturer, and so it serves her interests to be able to nurture, educate, and instruct her children—for example to teach them their "mother-tongue" and then use it to program their thinking in ways she approves. By these means the mother can indoctrinate, condition, and socialize her offspring in behaviour that is likely to benefit her equitable genetic investment in all of them. Here a top-down, contextual, holistic, and verbal cognitive style—*mentalism*, in my term—might be particularly useful in influencing a child's social interaction with its siblings, peers, and parents. This would make a child much more likely to see things from its mother's point of view—particularly to see them in a family context—and perhaps less likely to act impulsively on the promptings of its paternal brain[409][410]. Indeed, there is evidence that when what I am calling maternal brain centres are activated in dreaming (the forebrain and neo-cortex), aggressive impulses are inhibited and co-operative and pro-social ones expressed. However, when paternal brain centres such as the hypothalamus and amygdalas are active in dreams, aggressive impulses on the part of the dreamer emerge, just as the conflict theory of imprinting would predict[411].

We saw earlier that sex differences in cognition make sense in evolutionary terms and that in primal hunter-gatherer societies it would probably have promoted a woman's survival and reproductive success to be more mentalistic than a man (see above pp. xx-xx). One area where this might have been especially important is in relation to a woman's own children. As we have already seen, a major function of mentalism in every-day life is to manage and manipulate other people—for example, by naming, blaming and shaming—and very often mentalism can be an alternative to more physical means (see above pp. xx-xx). In raising their own children, it could have paid ancestral women to use mentalistic measures whenever possible for this reason alone. This is because making or preventing a child do something merely by a word, look, or gesture—by mentalistic means, in other words—is not merely energetically less costly than physically intervening, but is much less dangerous (not to mention more efficient because such expressions can often be directed to more than one recipient simultaneously). Manhandling a child always carries the danger of inflicting injury, however slight, and in really serious confrontations verbal and emotional substitutes for physical contact could prevent otherwise potentially serious injury. Forceful but purely mental expres-

[409] Badcock, C.R., *Evolutionary Psychology: a critical introduction*. 2000, Cambridge: Polity Press.

[410] Badcock, C.R., *Emotion versus reason as a genetic conflict*, in *Emotion, Evolution, and Rationality*, D. Evans and P. Cruse, Editors. 2004, Oxford University Press: Oxford. p. 207-222.

[411] McNamara, P., et al., *A ''Jekyll and Hyde'' Within: Aggressive Versus Friendly Interactions in REM and Non-REM Dreams.* Psychological Science, 2005. **16**(2): p. 130-6.

sions of maternal wishes could nevertheless be very effective, and so selection may have favoured mothers who could substitute verbal, emotional, and gestural expressions for more directly physical ones. And even though such substitutions may have had only marginal and minimal effects, natural selection, relentlessly working over the millennia, would gradually preserve them if there overall effect were (on average and all other things being equal) to promote the survival of the genes responsible.

Indeed, children too would have benefited to the extent that a child is physically smaller and weaker than its mother. Lacking an ability to influence its parent by more direct physical means, children who could use mentalistic ploys such as facial, emotional, and verbal expressions might also have marginally promoted their own survival and reproductive success if the effect of that was to secure them more parental investment, or avoid risk of injury. Tears, temper-tantrums, and cries of distress, in other words, could be as effective in their own way on a child's parent as any kind of physical compulsion that one adult could use against another. To this extent, both mothers and children may have had converging evolutionary interests in avoiding mindless violence and substituting the purely mental conflicts which are now so deeply woven into the fabric of family life that psychotherapists have been able to make a vocation of trying to unravel them[412].

The father, on the other hand, need make no obligatory biological contribution to his offspring beyond a single sperm, and other children of the same mother need not share his genes: *Mother's baby—father's? Maybe!* As a result, the father's genes build parts of the brain that tend to motivate self-interested, instinctual, and non-social behaviour, and his genetic self-interest is not necessarily served by his child seeing things its mother's way—for example, in making sacrifices for siblings to which its paternal genes may not be related in any way whatsoever. According to such a selfish- gene view of the matter, autism could be the consequence of the failure of the maternal brain in this respect, and the impulsiveness, compulsiveness, and contrariness of autistics the inevitable result of the paternal brain's corresponding success. The striking social deficits seen in autism would certainly fit the idea that paternal genetic self-interest underlies the disorder because autistic children seem perversely committed to doing things their own way, in their own time, and for their own selves. If they can learn at all, they usually refuse to do so in the way adults think they should, and inevitably pose a severe challenge to any care-giver (who in our evolutionary past would predominantly have been the mother and her relatives). Certainly, the reduced empathy, unco-operativeness and insistence of routine seen in autism hardly contribute to easy parenting. And as you would predict if autism was indeed caused by enhanced expression of the father's genes, studies suggest that autistics—and males in particular—are heavier than normal at birth, suggesting that they are indeed predisposed to consume more than usual of the mother's resources[413].

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[412] Trivers, R., *Parent-offspring Conflict.* American Zoologist, 1974. **14**: p. 24964.

[413] Sugie, Y., et al., *Neonatal factors in infants with Autistic Disorder and typically developing*

At the very least, the fact that all fathers are male explains why you could mistake autism for an extreme male brain disorder. But the fact that both males and females have both paternal and maternal brains as I am calling them easily explains why females as well as males can suffer from autism. More high-functioning autistics might be expected to be male if only their paternal brain were affected—perhaps driven to an extreme early in development by male sex hormones like testosterone which we have already seen appear to be a factor in vulnerability to autism (see above pp. xx-xx). The intact intelligence and verbal abilities of high-functioning, Asperger autistics would therefore be the result of predominantly normal maternal brain development, while the occasional appearance of mechanistic savant skills could be explained by an enhancement of characteristically male cognitive skills associated with an extreme paternal brain.

But if the balance between maternal and paternal parts of the brain was also an issue, you could imagine that another factor predisposing to autism might be underdevelopment of the maternal brain: that is, the neo-cortex and perhaps the frontal lobes in particular. Given the reliance of higher brain functions such as intelligence, language, and inhibition on the neo-cortex, you could readily understand why a combination of deficits in these maternal brain areas combined with excesses in the paternal ones resulted in a more severe disability. Again, because all mothers are female, you could understand why deficits in the maternal brain might be especially important where females were concerned, and this could partly explain why the sex ratio is much less skewed in the male direction at the severe end of the autistic spectrum. In other words, whereas you would expect mainly males to be affected by paternal brain preponderance, both sexes—but perhaps females in particular—might be affected by severe maternal brain deficits whose relative effect would be emphasis of paternal brain tendencies of the kind seen in classical (Kanner's) autism. Indeed, if maternal brain deficits showed themselves in reduced intelligence and language ability, then you would expect to find more of them among the most severely affected of both sexes—just as you do.

* * *

Another factor influencing the incidence of autism in relation to sex is the discovery that a gene on one of a woman's X chromosomes is protective. Genes are grouped together on chromosomes, and human beings have 46 of them: 23 from each parent, and one of which is a *sex chromosome.* Female mammals get a so-called X sex chromosome from each parent (they are XX), but males receive an X from the mother and a Y from the father (making them XY). Unfortunately for them, the X men receive from their mother does not carry the gene that protects against autism, partly explaining why so many more males than females are autistic[414].

In the case of abnormal females with three complete copies of the X chromosome—so-called *X-trisomy*—increased rates of schizophrenia have been reported. Imaging

infants. Autism, 2005. **9**(5): p. 487-94.

[414] Skuse, D.H., *Imprinting, the X-Chromosome, and the Male Brain: Explaining Sex Differences in*

studies show that XXX females exhibit three features of brain anatomy characteristic of schizophrenia: reduced brain volume and enlarged ventricles; reduced asymmetry of the prefrontal and temporal lobes; and a reduction in amygdala size. The smaller brains, reduced asymmetries, and smaller amygdala of X-trisomy females suggest that their increased X chromosome gene dosages results in a brain anatomically skewed towards a more female type [Crespi, In preparation #1909].

Klinefelter syndrome is caused by the presence of an additional X chromosome along with an existing X and Y (as in a normal male), so sufferers are XXY. This syndrome also involves a four- to ten-fold increase in liability to psychosis. Psychosis in Klinefelter syndrome normally involves a relatively high incidence of auditory hallucinations and paranoia like that found in female psychotics, along with the later age of onset which is also typical of the disorder in women. As in X-trisomy, Klinefelter syndrome patients exhibit aspects of brain anatomy similar to those in schizophrenia, including smaller whole-brain volume, reduced or reversed asymmetry of the pre-frontal and temporal lobes, and reduced volume of the amygdala. X- trisomy and Klinefelter syndrome involve parallel effects on brain anatomy and liability to psychosis which are presumably due in both cases to the extra X chromosome. Thus, in both XXX and XXY, the presence of an additional X results in brain features similar to those found in schizophrenia, and notably increased vulnerability to psychosis [Crespi, In preparation #1909].

In other words, the presence of an additional X chromosome makes its bearer more female in brain structure and cognition (as well as being less prone to autism). According to this theory, the differences between male and females in brain anatomy and cognition tend to parallel the differences between normal individuals and those exhibiting full-blown psychosis or milder psychotic tendencies. Just now we saw that there is something to be said for the view that autism is a disorder featuring an enhancement of what I called the paternal brain at the expense of the maternal brain. However, if psychoses like paranoid schizophrenia can indeed be seen as the hyper-mentalistic equivalent of autistic hypo-mentalism, then it suggests that, just as autism may represent extreme paternal brain tendencies, so such psychoses ought to go with an extreme *maternal* brain [Crespi, In preparation #1909].

We have already seen that Prader-Willi syndrome is caused by enhanced maternal and/or reduced paternal gene expression, whereas Angelman is the other way round: reduced maternal and/or enhanced paternal gene expression. If so, autism and psychosis may be similar: although the two disorders have until now seemed unrelated, genetically they may be the outcome of oppositely expressed genes as the diametrically different pattern of symptoms listed in table 5.1 suggests. Certainly, this possibility is supported by the variant of Prader-Willi syndrome mentioned earlier in which two copies of the mother's chromosome 15 are present, without one from the father (so-called *uniparental disomy* or *UPD*). Quite apart from any link with dyslexia, and by

the Liability to Autism. Pediatric Research, 2000. **47**(1): p. 9-16.

contrast to the variant of the syndrome in which paternal genes are deleted, the majority of maternal UPD cases become psychotic in adulthood, implicating the duplication of this maternal part of the individual's genome as the likely explanation[415].

The finding of high rates of psychosis in Prader-Willi syndrome with maternal UPD supports the suggestion that psychosis may result from the excessive expression of maternal genes, and/or reduced expression of paternal genes. Moreover, Prader-Willi maternal UPD cases exhibit less severe impairments in social behaviour than those with deletion of paternal genes[416][417]. Prader-Willi syndrome maternal UPD also involves stronger disruptions in visual-spatial abilities, as indicated by mathematical and 3-D visualization performance, and these patients lack the notably enhanced skill in doing jigsaw puzzles found in many cases of paternal deletion[418]. Taken together, these findings suggest that Prader-Willi maternal UPD cases exhibit better social and language functioning than deletion cases, but worse visual-spatial ability. This is a pattern consistent with increased effects from maternally-expressed imprinted genes which as we saw earlier can be expected to favour language and social skills by contrast to paternally-active ones, which can be predicted to favour visual, spatial, and maths skills (see above pp. xx-xx).

Earlier we also saw that Beckwith-Wiedemann syndrome and Silver-Russell syndrome have been recognized as another example of a pair of disorders which, like Prader-Willi and Angelman syndromes, can be driven by opposite disruptions of imprinting for the same or overlapping genes. The only systematic study conducted to date shows that Silver-Russell syndrome involves relative deficits in mathematical and visual-spatial ability but that more verbal skills are preserved. This pattern fits with the relatively superior verbal as compared to visual-spatial skills found in schizophrenic disorders mentioned at the end of the last chapter (see above pp. xx-xx) and with the pattern described above for Prader-Willi syndrome (Table 5.2). In other words, more maternal and/or less paternal gene expression is associated with more mentalistic skills, while less maternal and/or more paternal gene expression goes with more mechanistic ones.

While whole brain size is reduced in schizophrenia because of reductions in grey matter (neurones) and reduced and altered white matter (nerve fibres), brain size in autism is increased during early development thanks to a striking growth spurt between

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[415] Badcock, C.R., *Nature or Nurture? Genes or Society? Autism or Psychosis? A new theory resolves some long-standing contradictions in explaining mental illness.* Sociology Research News, 2008. **5**(3): p. 2-4.

[416] Whittington, J. and T. Holland, *Prader-Willi Syndrome: development and manifestations.* 2004, Cambridge: Cambridge University Press.

[417] Veltman, M.W., et al., *Prader-Willi syndrome – a study comparing deletion and uniparental disomy cases with reference to autism spectrum disorders.* European child & adolescent psychiatry, 2004. **13**(1): p. 42-50.

[418] Whittington, J., et al., *Cognitive abilities and genotype in a population-based sample of people with Prader-Willi syndrome.* Journal Of Intellectual Disability Research, 2004. **48**(2): p. 172-187.

birth and age four, an acceleration driven mainly by increases in white matter volume. However, after about age four, brain growth in autism levels off, so that adult brain size is not notably increased on average. Remarkably, a recent study of Asperger's syndrome showed that grey matter volume did not decrease with age between 15 and 50 as it does substantially in normal individuals. These findings suggest that autism and schizophrenia exhibit divergent patterns of grey matter loss, with little to no loss in autism, moderate loss in normal development, and high rates of loss in schizophrenia [Crespi, In preparation #1909].

The differences in brain size and development between autistic and schizophrenic individuals are paralleled by differences in birth-weight. As I mentioned just now, autistics have higher birth-weight compared to controls, but schizophrenics have consistently lower weight at birth, and it has been suggested that foetal growth restriction, mediated by imprinting effects, contributes to the development of schizophrenia. Foetal and neonatal brain growth, especially deposition of brain fatty acids, is the single most metabolically-costly event during pregnancy and early postnatal life. Mothers bear most of this cost, and indeed, during the latest stages of pregnancy mothers metabolize their own brain fat for transfer to the foetus, which can trigger post-partum psychosis. According to the theory proposed here, the contrasting patterns of brain size, growth, and birth-weight in psychosis and autism are mediated by effects of paternal versus maternal genes, with paternal genes driving the acquisition of increased brain fatty acids. Indeed, human babies exhibit by far the highest average body fat content of any mammal, and this may represent an adaptation to fuel rapid, sustained brain growth driven by the conflicting interests of parentally-active genes of both parents[(419)]. Again, a striking finding is that schizophrenics have less cancer than normal despite the fact that they smoke much more. As the tumours often found associated with Beckwith-Wiedemann syndrome suggest, the reason for this could be that paternally-expressed imprinted genes tend to promote the development of cancer—which is another form of overgrowth—while many maternally-expressed genes act as tumour-suppressors and reduce cancer risk [Crespi, In preparation #1909].

The *hippocampus* is a part of the brain which is centrally involved in learning and the consolidation of memory, with the right side more involved in spatial cognition, and the left side more focussed on episodic and autobiographical memory (see above pp. xx-xx). By contrast, the amygdala, which as we saw earlier functions very much as an alarm system (see above pp. xx-xx), provides emotional input to brain structures such as the hippocampus and neo-cortex. The amygdala has many testosterone receptors and grows more rapidly in teenage boys, while the hippocampus (which has many oestrogen receptors and plays an important part in memory and language) grows more quickly in

[(419)] Badcock, C.R., *Evolutionary Psychology: a critical introduction*. 2000, Cambridge: Polity Press.

girls[420][421]. The available evidence indicates that relative to brain size, the hippocampus and amygdala are larger in autism (at least during early development), and smaller in schizophrenia and related personality disorders. In schizophrenia, smaller size and altered shape of the hippocampus may be functionally related to positive symptoms such as paranoia and delusions, in that the hippocampus mediates the creation, maintenance, and updating of social and spatial world-views and beliefs, via interactions with the neo-cortex and amygdala. In autism, on the other hand, increased hippocampus size may be related to enhanced visual-spatial and mathematical aspects of cognition best seen in the mechanistic gifts of autistic savants (see above pp. xx-xx) [Crespi, In preparation #1909].

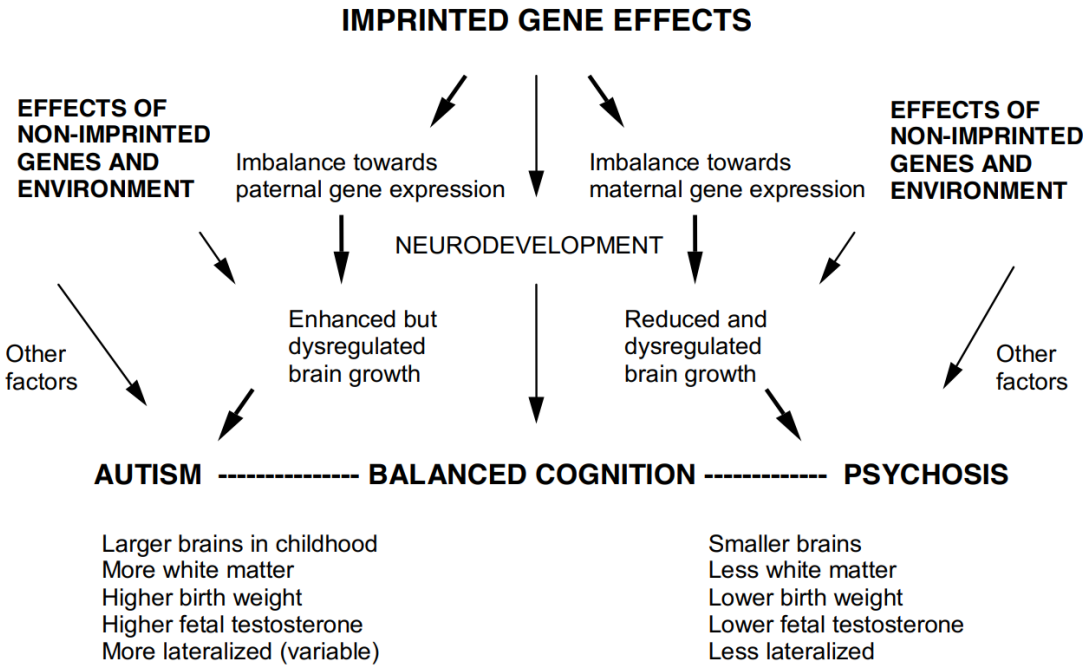

Figure 5.1 (Courtesy Bernard Crespi)

We saw earlier that, whereas most normal individuals are right-handed, with a dominant left hemisphere, there are important differences in brain lateralization in autism and Asperger's syndrome, with a definite tendency towards the more spatial, right side at the expense of the verbal, left hemisphere (see above pp. xx-xx). The tendency towards the right in autism may be due simply to a faster, earlier pattern of brain

[420] Sowell, E.R., et al., *In vivo evidence for post-adolescent brain maturation in frontal and striatal regions.* nature neuroscience, 1999. **2**(10): p. 859-861.

[421] Giedd, J., et al., *Brain development during childhood and adolescence: a longitudinal MRI study.* Nature Neuroscience, 1999. **2**: p. 861-3.

development which is the exact opposite of that seen in schizophrenia. Indeed, this shift in the timing of development appears directly analogous to the overgrowth syndromes typical of imbalances towards paternal-gene expression effects in placental and foetal growth. By contrast, schizophrenia involves reduced structural and functional asymmetry in the brain, and this reduced lateralization is associated with slower brain development, left hemisphere dysfunction, diminished left-hemisphere specialization for language, and an increase in the extent of positive symptoms such as delusions. Similar patterns have been detected in healthy individuals, in whom the degree of schizotypical cognition is positively associated with mixed handedness and other evidence of reduced cerebral lateralization [Crespi, In preparation #1909].

Schizophrenic men tend to have a ratio of index- to ring-finger length which resembles the generality of women more than it does that of men—an effect which we saw earlier was related to pre-natal exposure to sex hormones and the reverse of the situation found in autistics (see above pp. xx-xx)[422]. We have also seen that erotomania appears to be a predominantly female pathology, and although there is a slightly higher incidence of schizophrenia overall in men, women do in fact suffer more paranoid delusions and hallucinations than do men, particularly in late-onset cases. Rates of incidence of schizophrenia among family members of women with the disorder are higher than those among family members of men with schizophrenia[423]. Again, in the previous chapter I suggested that religion, magic, and superstition could be understood as normal, socially-legitimated expressions of hyper- mentalism. I also pointed out that the so-called magical ideation which underlies all three has also been linked to schizophrenic tendencies (see above xx-xx). The clear implication of the argument being developed in this chapter is that if X chromosome and maternally-active genes play the role in psychosis that paternal genes and the Y chromosome seem to play in autism, then women should be found to be more religious, superstitious, and magically-minded than men. Furthermore, there is good evidence that they are.

Self-transcendence is one well-validated personality measure of mystical tendencies on which women have been found to score 18 per cent higher than men[424], and many other measures show a comparable sex difference in attitudes towards the supernatural. According to one study, 79 per cent of women believed in a range of paranormal phenomena, as against 59 per cent of men, and sex has been called "the only significant demographic variable" found in such studies. Nick Humphrey, who cites these findings, believes that the explanation may be that "it is women who arguably have the greater sensitivity to human personal relationships—and who, as every contem-

[422] Frecska, E. and H. Kiss, *Digit length pattern in schizophrenia suggests disturbed prenatal hemispheric lateralization.* Progress in NeuroPsychopharmacology & Biological Psychiatry, 2004. **28**(1): p. 191-194.

[423] American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders.* Fourth, Text Revision ed. 2000, Washington, DC: American Psychiatric Association. 943.

[424] Hamer, D., *The God Gene: How Faith Is Hardwired Into Our Genes.* 2004, New York: Anchor Books. 240.

porary survey shows, tend to be surest that the scientific picture of the world is incomplete" (Humphrey 1996 pp. 4, 51). If we add that science is incomplete because it is mechanistic, rather than mentalistic, and that both forms of cognition comprise human cognition, we can begin to see why the alternative to the mechanistic, scientific view of reality should so often be seen as the mentalistic one enshrined in magic, and superstition—not to mention religion. Indeed, according to a recent sociological account,

That men are less religious than women is a generalization that holds around the world and across the centuries. ... So far as is known, throughout recorded history religious movements have recruited women far more successfully than men, except for those that excluded women from membership. . That folklore has long classified religion as "women's work" is well supported by denominational yearbooks and available religious census data: in every sizeable religious group in the Western world, women outnumber men, usually be a considerable margin. . By now it is so taken for granted that women are more religious than men that every competent quantitative study of religiousness routinely includes sex as a control variable.[425]

Sociologists are clearly at a loss to explain why this should be so, and recently have even despaired of their stock-in-trade explanation that women are only more religious than men because they are nurtured to be so[426]. However, the finding that women are generally speaking also more mentalistic than men in their cognitive style easily explains why they should also be more religious. If religion is indeed institutionalized, collective, and legitimated hyper-mentalism as I suggested earlier, it follows that we would expect the more mentalistic of the two sexes to be normally more hyper- mentalistic too. But of course, because men also have maternal brains in the sense in which I am using the term (that is, parts of the brain, like the neo-cortex which are expressed from the mother's rather than the father's genes), hyper-mentalism on their part can also be explained. So just as we have already seen that the paternal brain theory can neatly explain why so many autistics are female, the maternal brain theory of psychosis can explain why so many men are psychotic—not to mention superstitious or religious.

* * *

Nevertheless, there is one important difference between a mentalistic—or even hyper-mentalistic—maternal brain in a man and the same brain in a woman. Because all mothers are female, a maternal brain in a woman is in harmony with her sex in a way in which such a brain in a man is not. But by the same reasoning, the hyper-mentalism I am attributing to paranoia suggests the prediction that in a man such a tendency could go with some measure of inner conflict relating to his sexual identity. Of course, you could make a parallel prediction in autism: even if this is indeed an extreme *paternal* brain rather than extreme *male* brain disorder, the fact that all

[425] Stark, R., *Physiology and Faith: Addressing the Universal Gender Difference in Religious Commitment.* Journal for the Scientific Study of Religion, 2002. **41**(3): p. 495-507.

[426] Miller, A.S. and R. Stark, *Gender and Religiousness: Can Socialization Explanations Be Saved?* American Journal of Sociology, 2002. **107**(6): p. 1399-1423.

fathers are male would nevertheless suggest that female autistics might experience a similar conflict. Nevertheless, we also saw in a previous chapter that autistics are symptomatically mind-blind, not just to the minds of others, but also to their own minds, and this suggests that inner psychological conflict over sexual identity might be less likely to be expressed, particularly in the most severe, Kanner-type cases where we have already seen the sex ratio of incidence is much less skewed towards males. At the very least, the severe verbal deficits usually seen in Kanner's autism mean that even if present, female sufferers are much less likely to be able to verbalize such a conflict. But the conflict could still be there nevertheless, and might be an important factor in explaining the greater severity of the disorder. In other words, male autistics would, according to this reasoning, tend to manifest less severe symptoms—exactly as they indeed do if we recall the extreme male preponderance seen in so-called "high-functioning", Asperger autism.

In the contrasting case of male psychotics, we might also predict that the conflict between the individual's sex and their feminized brain would be associated with more severe symptoms, perhaps explaining why there are so many male psychotics despite psychosis being (according to this way of looking at things) an extreme maternal brain disorder. And if psychosis is indeed hyper-mentalistic, we could make the contrary comment to the one I have just made in connection with autism. As we have seen, psychotics like Schreber have bizarrely over-elaborated psyches, and so we might expect such cases to express the conflict clearly—particularly if, as in his case, the individual was also verbally very fluent. Indeed, Schreber remarks that "My sleep is often disturbed by dreams" whose "tendentious content" he described as "'being retained on the side of men' in contrast to cultivating 'feminine feelings'". Elsewhere he remarks in connection with the cosmic conspiracy which he believed existed to turn him into a woman for purposes of "sexual misuse" that "one may imagine how my whole sense of manliness and manly honor, my entire moral being, rose against it... it was my duty to fight now and then to prove my manly courage, I could think of nothing else but that any manner of death, however frightful, was preferable to so degrading an end"[(427)].

Whether such a sexual conflict is true of all or even many male paranoid psychotics is currently unknown, but it is worth pointing out in passing that Sigmund Freud interpreted paranoid delusions in men as defences against passive homosexual tendencies. At the very least, there is overwhelming evidence for this conclusion in Schreber's *Memoirs*, as Freud was at pains to point out. In his account of the case, Freud quotes Schreber's belief that

no *reasonable* course lay open to me but to reconcile myself to the thought of being transformed into a woman. The further consequence of my emasculation could, of course, only be my impregnation by divine rays to the end that a new race of men might be created ... Since then, and with full consciousness of what I did, I have

[(427)] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

inscribed upon my banner the cultivation of femaleness ... my emasculation may even yet be accomplished and may result in a new generation issuing from my womb by divine impregnation.[428] [Schreber's emphasis]

Indeed, Schreber also claimed that

Something occurred in my body similar to the conception of Jesus Christ in an immaculate virgin, that is, in a woman who had never had intercourse with a man. On two separate occasions (and while I was still in Professor Fleschig's institution) I have possessed female genitals, though somewhat imperfectly developed ones, and have felt a stirring in my body, such as would arise from the quickening of a human embryo. Nerves of God corresponding to male semen had, by a divine miracle, been projected into my body, and impregnation had thus taken place.

Freud points out that "The idea of being transformed into a woman was the salient feature and the earliest germ of his delusional system. It also proved to be the one part of it that persisted after his cure, and the one part that was able to retain a place in his behaviour in real life after he had recovered. Schreber believed that by stimulating parts of his own body such as the breast "I am able to evoke a sensation of voluptuousness such as women experience, and especially if I think of something feminine at the same time." By means of such fantasizing—which he called "drawing"—he was able to transform himself into a woman:

It has become so much a habit with me to draw female buttocks on to my body . that I do it almost involuntarily every time I stoop . anyone who should happen to see me before the mirror with the upper portion of my torso bared—especially if the illusion is assisted by my wearing a little feminine finery—would receive the unmistakable impression of a *female* bust .No sooner . am I alone with God . than it becomes a necessity for me to employ every imaginable device . to bring it about that the divine rays have the impression as continuously as possible . that I am a woman luxuriating in voluptuous sensations . God demands *a constant state of enjoyment* . and it is my duty to provide Him with this . in the shape of the greatest possible generation of spiritual voluptuousness . God would quietly and permanently yield to my powers of attraction, if it were possible for me *always* to be playing the part of a woman lying in my own amorous embraces.[429] [Schreber's emphasis]

Freud concludes: "He took up a feminine attitude towards God; he felt that he was God's wife"[430].

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[428] Freud, S., *Psycho-analytic Notes on an Autobiographical Account of a Case of Paranoia*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1911, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-82.

[429] Freud, S., *Psycho-analytic Notes on an Autobiographical Account of a Case of Paranoia*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1911, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-82.

[430] Freud, S., *Psycho-analytic Notes on an Autobiographical Account of a Case of Paranoia*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1911, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-82.

Quite apart from its role in explaining Schreber's hyper-mentalism and its contribution to his psychosis, the X chromosome may also hold the key to these transparent bisexual fantasies and rationalizations. To see how this comes about, we need to consider sex chromosome inheritance a little further.

From an evolutionary point of view, X chromosome genes spend two-thirds of their time in female bodies thanks to females having two X chromosomes and males having one. As a result, they are regularly subjected to twice as much selection for female, as opposed to male, reproductive interests, as Hamilton was the first to point out[431]. Essentially, this is why we found that X chromosome genes are comparable to maternally-active imprinted ones elsewhere in the genome: as we shall see shortly, they have a naturally-selected female bias. Consequently, if women are normally more mentalistic than men, X chromosome genes can be expected to show the same tendency, explaining the role of the X in psychosis explained earlier.

People sometimes balk at talk of such so-called *intragenomic conflict*, and treat it very much as a metaphor (in other words, mentalistically) rather than a reality (that is, mechanistically). But sex chromosome gene conflict is very real, and can sometimes have far-reaching consequences for the whole organism. For example, a gene on the X chromosome called *DAX1* acts as an antagonist to the gene on the Y that initiates male development. Normally, this gene, *SRY* (for *Sex-determining Region of the Y,* but alias *TDF* for *Testis-determining factor*) transforms what would otherwise develop as ovaries into testes, with subsequent masculinization of the whole body (largely thanks to the male sex hormones produced by the testes). However, otherwise normal XY males with a duplication of part of the short arm of the X chromosome that contains *DAX1* show male-to-female sex reversal. Although the exact mechanism by which this comes about had not been determined at the time of writing, protein products of the two genes probably compete with each other for control of sexual development. It seems likely that the dose of *DAX1* carried on a normal male's single X chromosome is not enough to reverse male development, but a double dose provided by duplication of the *DAX1* region of the X chromosome is sufficient, and so sex reversal occurs. At the very least, this finding shows that particular genes on the X and Y chromosomes can be in conflict with one another. Indeed, *DAX1* has been described as more of an "anti-testis gene" than a "pro-ovary" gene[432].

The case of *DAX1*/*SRY* shows that conflicts involving individual sex chromosome genes can have a critical bearing on sexual development in humans. But the inheritance of sex chromosomes as a whole is also the occasion for a major problem where sex-determination is concerned. To see why, suppose for a moment that all the genes needed to make a male rather than a female were on the Y chromosome. Because females never normally inherit any part of this chromosome, there could be no danger

[431] Hamilton, W.D., *Extraordinary Sex Ratios.* Science, 1967. **156**: p. 477-88.

[432] Swain, A., et al., *Dax1 antagonizes Sry action in mammalian sex differentiation.* Nature, 1998. **391**: p. 761-7.

of a female being affected by male genes, and being masculinized as a result. But if, as is in fact the case, very few genes indeed relating to being male are found on the Y chromosome, it follows that most of them must be on other chromosomes that females do inherit: 22 non-sex chromosomes and the X. If this is so, then any such genes could be accidentally expressed, resulting perhaps in masculinized females. However, the problem is not confined to the Y. The fact that

the X chromosome is also inherited by males but that, as we have already seen, its genes find themselves in female bodies twice as often as they do in male ones, means that female-benefiting X chromosome genes can all too easily be expressed in males. A still-controversial example is the claim that at least some cases of male homosexuality have a genetic basis, probably to be found on the X chromosome[433][434].

At first sight, it might seem very strange that there could ever be "gay genes". You might wonder why natural selection could have been so foolish as to place genes that usually reduce male reproductive success in the male genome. Surely, those without such genes would do better in competition for mates and offspring, and so genes for homosexuality would soon be selected out (at least if they feminized males, or reduced a male's reproductive success in any other significant way). Nevertheless, it is perfectly possible that the genes concerned with male homosexuality on the X chromosome may ultimately turn out to be "for" much more basic physiological processes, such as enzymes involved in female reproductive physiology. It may simply be that these genes benefit female reproductive success at a cost to males who carry them and perhaps lack other genes that might otherwise protect them, or compensate in some way. So most males might escape, but a proportion would pay the price for genes whose benefit accrued to their near female relatives. Again, genes for male homosexuality could act like *DAX1*, and may simply have an effect depending on the dosage: too much, and partial feminization of behaviour occurs, showing itself as a homosexual tendency in the men affected. The point is that, as Hamilton was the first to fully realize, natural selection is not ultimately concerned with individuals, but with their genes. If particular genes benefit the female relatives of males who carry them more than they harm the males concerned, natural selection cannot correct the situation. Indeed, if the genes concerned are as in this case on the X chromosome, the fact that females have two such chromosomes but men only one means that (on average and all other things being equal) the gene or genes in question need only promote a woman's reproductive success half as much as they damage a man's to escape being selected against.

Certainly, there is now good evidence that, as this selfish-gene view of the matter would suggest, male homosexuality should be more heritable through the female line and that male homosexuals should be found to have female relatives with above average fertility. In a sample of 98 homosexual and 100 heterosexual men and their relatives (a

[433] Hamer, D., et al., *A Linkage Between DNA Markers on the X Chromosome and Male Sexual Orientation.* Science, 1993. **261**(16/7): p. 321-6.

[434] Hamer, D. and P. Copeland, *The Science of Desire: The Search for the Gay Gene and the Biology of Behavior.* 1994, New York: Simon & Schuster. 272.

total of over 4,600 individuals), female maternal relatives of homosexuals were found to have higher fecundity than female maternal relatives of heterosexuals, but this difference was not found in female paternal relatives. In the words of the authors, "there might be, hitherto unsuspected, reproductive advantages associated with male homosexuality." The study also confirmed previous reports that homosexuals have more maternal than paternal male homosexual relatives[435].

The same study also corroborated a previous finding that homosexual males are more often later-born than first-born, and that they have more older brothers than older sisters. Boys with an average of 2.5 older brothers are twice as likely to be homosexual as those with none, and boys with four older brothers are three times as likely to be homosexual. However, older sisters make no difference to the incidence of homosexuality in their younger brothers. Nor can the finding be explained by the increased age of the mother, and there is no similar effect on later-born females.

According to one recent account, "Regardless of culture, demography or psychological state, having more older brothers predisposes a man to being homosexual"[436]. Furthermore, the effect appears to be genetic rather than environmental: a study of 944 men found the older brother effect only in those who shared the same mother, not in those with different mothers, and irrespective of whether they shared the same home[437].

The most likely explanation is that the mother's immune system progressively reacts to male foetuses in a way which increasingly predisposes them to homosexuality. For example, maternal antibodies to an antigen produced by male foetuses may be capable of affecting foetal brain development without affecting gross anatomy. The so-called *Y-linked minor histo-compatibility antigen*—or *H-Y antigen*—is present only in males and highly conserved in evolution. It is strongly presented on the surface of brain cells, and male mice whose mothers were given the H-Y antigen prior to pregnancy are much less likely to mate successfully when they mature[438].

Although this might look at first like an almost random environmental factor, further reflection shows it to be yet another case of genetic conflict, albeit this time one between a mother and her male foetus. This is because it is the XX mother's immune system's reaction to the presence of the Y chromosome-linked antigen that appears to be the operative factor. Essentially, the mother is treating the H-Y antigen as if it were alien genetic material, such as that in a virus or other infecting pathogen. And far from being exceptional or pathological, genetic conflict of many different kinds between

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[435] Camperio-Ciani, A., F. Corna, and C. Capiluppi, *Evidence for maternally inherited factors favouring male homosexuality and promoting female fecundity.* Proceedings of the Royal Society of London B, 2004. **271**: p. 22172221.

[436] Motluk, A., *The big brother effect*, in *New Scientist*. 2003. p. 44-5.

[437] Bogaert, A., *Biological versus nonbiological older brothers and men's sexual orientation.* Proceedings of the National Academy of Sciences of the USA, 2006. **103**(28): p. 10771-10774.

[438] Blanchard, R. *Conference Presentation: Theory and Research on Birth Order and Sexual Orientation*. in *Human Behavior and Evolution Society*. 1999. Salt Lake City.

mother and foetus of either sex is now a firmly established fact of human development. As I briefly mentioned earlier in this chapter, both diabetes and hypertension in pregnant women are attributable to paternally-active genes in the foetus which produce effects that benefit the baby at a cost to the mother[439].

At present, not much is known about how genes or antibodies affect sexual orientation, but the answer is likely to be that they do so by building differences into the brain during early growth, for example because of the presence of the H-Y antigen on the surface of brain cells mentioned just now, or through the influence of sex hormones such as testosterone on brain development. In the case of mice, for example, a study of the patterns of expression of 23,574 genes in 334 individuals showed that more than half were different between the sexes, and specifically that 14 per cent of genes were differently expressed in the brains of males as compared to females[440]. Where human beings are concerned, a recent study suggests that homosexuals of both sexes may have acquired their sexual orientation very early in life, perhaps even in the womb. The researchers investigated the *startle response* which is produced when the eye blinks involuntarily after a sudden, loud noise. If the loud noise is preceded by a quieter warning noise, it results in significantly lower startle response, an effect termed *pre-pulse inhibition* (or *PPI*). The difference in PPI between heterosexual men and women is statistically significant, and because it is completely involuntary, it is believed to be an effect of the innate architecture of the brain. In heterosexual women, PPI causes a 13 per cent reduction in startle response, whereas in heterosexual men PPI causes the startle response to be 40 per cent weaker. Lesbians and homosexual men have PPIs of 33 and 32 per cent respectively. According to one authority: "The PPI test is a powerful measure of the brain's ability to filter and process information. Information processing is fundamental to the way the brain works and these results suggest evolutionary divergences between male- and female-oriented brains"[441]. According to a recent summary of the evidence, "By acting during critical periods of neural development, testosterone and its metabolites cause male and female brains to develop differently. These differences manifest themselves in a variety of ways, such as sizes of particular regions of the brain, number of nerve cells, distribution of neuro-transmitters, and even in development of behaviour"[442]. Indeed, we now know that *sry*—the male sex-determing gene in mice—is directly expressed in the brain, independent of sex hormones, and the same could well be true in man[443].

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[439] Haig, D., *Genetic conflicts in human pregnancy.* Quarterly Review Of Biology, 1993. **68**(4): p. 495-532.

[440] New Scientist, *Sex differences run deeper than we think*, in *New Scientist.* 2006: London. p. 19.

[441] Connor, S. *Independent News.co.uk.* 2003 15 October 2003; Available from: http://news.mdependentco.uk/world/science medical/story.jsp?story=453529.

[442] Dewing, P., et al., *Sexual dimorphic gene expression in mouse brain precedes gonadal differentiation.* Molecular Brain Research, 2003. **118**: p. 82-90.

[443] Dewing, P., et al., *Direct Regulation of Adult Brain Function by the MaleSpecific Factor SRY.* Current Biology, 2006. **16**: p. 415-420.

Bocklandt and Hamer also recently pointed out that because both homosexual men and women often have normal gender identity despite same-sex attraction, "a search for biological factors influencing sexual orientation should focus on factors acting down-stream of androgen-induced brain masculinization," and mention the finding cited earlier relating to birth-order of boys as an example. However, they also go on to make the suggestion that "sex-specific gene expression could be regulated by genomic imprinting". Paralleling a suggestion advanced earlier by Green and Keverne[444], Bocklandt and Hamer make the point that because only females inherit an X chromosome from their father, it is a prime candidate for carrying "feminizing" genes. Indeed, they add that such feminizing genes could be implicated in choice of sexobject, and that a failure in the imprinting mechanism allowing the expression of such an X chromosome gene in a man might contribute to homosexual object-choice[445]. More recently still, genome-wide scans of genes involved in male sexual orientation yielded three candidate regions on chromosomes 7, 8 and 10. One of the genes in the region indicated on chromosome 7 is critical to development of a brain area (the *suprachiasmatic nucleus*) which has been reported to be larger in homosexual men. Although both parents were found to contribute equally to the areas of chromosomes 7 and 8 indicated, there was evidence that in the case of the region on chromosome 10 maternal inheritance was more important than paternal, suggesting that imprinting may be a factor affecting men's sexual orientation on other chromosomes apart from the X[446].

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At the time of writing, the genetic, physiological, and neurological mechanisms underlying both autism and psychosis—not to mention homosexuality—remain unknown. Nevertheless, this chapter has outlined a new way of relating all three, and has suggested a genetic mechanism—intragenomic conflict between imprinted and sex chromosome genes—that might explain many of the facts. Only time can tell if this approach will be a fruitful one, but whatever else may be said about it, William Hamilton certainly thought that genetic conflict made much sense of his own somewhat autistic mind. Hamilton remarks that his insights into evolution had genetics had revealed that

> the genome wasn't the monolithic data bank plus executive team devoted to one project—keeping oneself alive, having babies—that I had hitherto imagined it to be. Instead, it was beginning to seem more a company boardroom, a theatre for a power struggle of egoists and factions. Emergent from the potential strife I was having to imagine ... a kind of parliament of the genes, and the signs suggested a rowdy parliament at that.

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[444] Green, R. and E.B. Keverne, *The Disparate Maternal Aunt-Uncle Ratio in Male Transsexuals: an Explanation Invoking Genomic Imprinting.* Journal of Theoretical Biology, 2000. **202**: p. 55-63.

[445] Bocklandt, S. and D.H. Hamer, *Beyond hormones: A novel hypothesis for the biological basis of male sexual orientation.* Journal of Endocrinological Investigations, 2003. **26**(Supplement to no. 3): p. 8-12.

[446] Mustanski, B.S., et al., *A genomewide scan of male sexual orientation.* Hum Genet () :, 2005. **116**: p. 272-278.

Indeed, he confesses that "Seemingly inescapable conflict within diploid organisms"—that is, those with both fathers and mothers—"came to me both as a new agonizing challenge and at the same time a release from a personal problem I had had all my life. In life, what was it I really wanted? My own conscious and seemingly indivisible self was turning out far from what I had imagined ..." Then, speaking of himself as the vehicle of his genes or agent of his genome as discussed at the beginning of this chapter, he continues,

I was an ambassador ordered abroad by some fragile coalition, a bearer of conflicting orders from the uneasy masters of a divided empire. Still baffled about the very nature of the policies I was supposed to support, I was being asked to act, and to act at once—to analyse, report on, influence the world about me. Given the realization of an eternal disquiet within, couldn't I feel better about my own inability to be consistent in what I was doing, about my indecision in matters ranging from daily trivialities up to the very nature of right and wrong? . As I write these words, evenso as to be able to write them, I am pretending to a unity that, deep inside myself, I now know does not exist. I am fundamentally mixed, male with female, parent with offspring, warring segments of chromosomes that interlocked in strife millions of years before.[(447)]

With these words of Hamilton's in mind, what is so instructive about the case of Schreber is not the fact that both male and female sexual mentalities were present in his psychological make-up, but the degree of the conflict to which these opposing tendencies gave rise. According to this way of looking at things, the only thing that truly distinguished Schreber from the rest of us was the degree to which his mind was distorted by mental conflict, not the existence of the conflict as such. Hamilton's words suggest that similar conflicts take place in all of us, but that most of us are lucky enough to escape their worst effects. Consequently, here lies a secure foundation for a humane and constructive attitude to mental health and illness alike. Normality, according to this view, would be the happy outcome of a more or less balanced expression of oppositely-imprinted and sex chromosome genes built into a brain which could walk the tight-rope between the hypo-mentalism of autism and the hyper-mentalism of psychosis while avoiding internal sexual conflicts of the kind which completely unbalanced Schreber and gave rise to his bizarre delusion of becoming the wife of God.

[(447)] Hamilton, W.D., *Narrow Roads of Gene Land: Evolution of Social Behaviour*. The Collected Papers of W. D. Hamilton. Vol. 1. 1996, Oxford: W. H. Freeman/Spektrum. 552.

6. Mendacity and the Mind in Man and Machine

Many science-fiction scenarios suggest that our first contact with extra-terrestrial beings might not be in person so to speak, but via a communication channel which they had opened with us. At the very least, this would simplify contact because it would only demand that the aliens expressed themselves comprehensibly in some language we could understand or translate—for example by words on a computer screen: extra-terrestrial emails, as it were. But even this would be challenging, because so much of what people say in text messages like emails relies on both parties sharing not just a common vocabulary and grammar, but a similar common-sense understanding of the world. Aliens who sent a message to someone out of the blue saying "We wish to have intercourse with you", and signed it "The Extra-terrestrials" would need to know that such a message would in many cases never be delivered thanks to Spam-filtering software which would sift it out (or at the very least shunt it into the recipient's Adult Content folder!). And of course, even if it were delivered, the chances of it being taken seriously would be minimal.

In reality, the aliens would face a problem very similar to one that challenges computer software designers—at least where so-called *user-interfaces* are concerned. This is the area where computer and human user interact, and clearly the ultimate user-interface would be one where you could relate to a computer just as you would to another person: by means of speech, gesture, emotional expression, and body language—an interface, in other words, that was *intelligent* in the same way that people are intelligent. Given that any extra-terrestrials who actually travelled to Earth or communicated with us would have to be quite highly intelligent, it follows that such an intelligent user-interface would also be the interactive medium of choice for them too. So they might fashion computer interfaces or human-looking robots which could communicate with us just like another human being, no matter how different the aliens themselves might be in appearance, mentality, or manner.

Of course, this is pure speculation—science-fiction, in fact—but the point is that, in order to do this aliens or human software designers would have to learn how to engineer what autistics symptomatically lack: the skills of mental interaction with others. So again, although purely a metaphor, the autistics-as-aliens idea has a critical basis in truth. Both extra-terrestrials (were they to exist) and autistics would seem alien in the same way that the workings of a computer are inevitably alien: because they lack the ability to interact mentally with human beings. And were anyone ever to engineer

a truly intelligent user-interface of the kind I have just described, they would have to know how to give it the mental and inter-personal skills that autistics characteristically find so difficult.

In the past, people have compared autistics' characteristically mechanistic style of thinking to the way computers work, but mainly to emphasize the shortcomings of both where dealing with mentalism is concerned[448]. Here I want to approach the problem from the opposite perspective, and look at the issue of how mentalistic skills could be implemented mechanistically. As we shall see, the answer gives a new perspective on mentalism itself, and suggests that in the future, computers—and by implication autistics—might not seem so alien to the mental majority that come into contact with them. On the contrary, I hope to show that some important new insights into mentalistic cognition can be gained from looking at things in this characteristically "autistic," mechanistic way.

Computers are essentially electronic circuits that process numbers, and which work in ways very different from human brains. However, human beings have to use them, and this creates the problem of designing an *interface*—or point of contact—between the computer and the human user. Nevertheless, this is not true of everyone. Autistics, by contrast, sometimes report that communicating with computers is easier than talking to people, and as we have already seen, many say they relate to machines more readily than they do to human beings[449]. The first computers used the so-called *line command interface* in which the user typed in strings of symbols (usually using a keyboard), which were then interpreted by the computer's operating system. Such line commands were often easier for the computer than for the user, because human beings do not usually communicate by way of strings of otherwise meaningless alpha-numeric symbols which nevertheless have to be correct in every detail. In other words, the line command interface was not very "user-friendly"—a phrase originated by the personal computer industry—and could certainly occasion much frustration in those who had to use it. The next major step occurred with the arrival of the *graphical user-interface* or *GUI* for short. This enabled the user to drive a pointer around the computer screen by use of a mouse or other device, and to give commands by clicking the mouse button or its equivalent on graphic icons displayed on the computer screen, which were designed to represent items of the software, such as files, or procedures like saving, copying, or deleting. This arrangement was much easier for most people to understand, because of its visual, graphic basis, and because it largely dispensed with strings of arbitrary symbols as the chief way of interacting with the computer's operating system.

However, GUIs are certainly not the ultimate in user-interfaces, even though they are ubiquitous today. Certainly, where the operating systems of personal computers are concerned, gaze monitoring ability would be very useful in a user-interface— partic-

[448] Vermeulen, P., *Autistic Thinking - This is the Title.* 2001, London and Philadelphia: Jessica Kingsley Publishers. 159.

[449] Shore, S., *Beyond the Wall: Personal Experiences with Autism and Asperger Syndrome.* 2001, Shawnee Mission, Kansas: Autism Asperger Publishing Co. 174.

ularly if the system could also understand spoken commands. You could imagine some future computer interface in which the user merely glanced at the icon of a document and said, "Open this," or "Print that," and the operating system, having monitored the direction of the user's gaze and understood their intention from what they said, would carry out the command without any further input. Such monitoring might enable the system to see the user coming and launch itself without any command to do so, or shut down automatically once it had seen that the user had no further need of it. Such systems would not merely monitor the gaze and attention of its user, but also ideally would be able to interpret its user's intentions—at least in so far as they applied to its own operations.

Although at present this may sound far-fetched as applied to personal computers, there are other applications for which such interface technology is already being developed. Voice recognition systems, for example, are already in use in combat aircraft, nowadays often flown under HOTAS conditions. This is an acronym for *Hands On Throttle And Stick*, and means that the pilot does not have the option of using his hands to interact with the aircraft's computers. Here voice communication is an obvious solution, and gaze-monitoring is also being developed as a means of enabling pilots to interact with aircraft systems without the use of their already fully- occupied hands. Although actually firing a weapon will probably remain a hands-on task for safety reasons, HOTAS means that a single stick-mounted firing button must suffice for all weapons. So a tiny camera in pilots' helmets can monitor eye movements, and arm a particular weapon represented on a head-up display when it is selected by the pilot's direction of gaze.

Even though such systems may be extremely expensive today and demand more processing power than current personal computers provide, there has been an inexorable tendency for cutting-edge developments in computing to become commonplace in a remarkably short period of time, and for capacity to grow exponentially while costs drop dramatically. The cost of computer memory, for example, had dropped by about sixteen thousand times per unit by the end of the twentieth century compared to the mid 1970s, and by about a hundred and fifty million times compared to what it was in 1948[(450)]! Indeed, according to *Moore's Law*, the number of elements in advanced integrated circuits doubles approximately every year[(451)]. Again, satellite navigation and moving-map displays appeared first in combat aircraft only a couple of decades ago, but today are increasingly found in cars and other vehicles—and are even beginning to appear in mobile phones. Indeed, even gaze-monitoring may find a widespread application in vehicles where a system is being developed to use clues from a drivers'

[(450)] Kurzweil, R., *When Will HAL Understand What We Are Saying? Computer Speech Recognition and Understanding*, in *HAL's Legacy: 2001's Computer as Dream and Reality*, D.G. Stork, Editor. 1997, MIT Press: Cambridge, Massachusetts. p. 132-69.

[(451)] Kuck, D.J., *Could We Build HAL? Supercomputer Design*, in *HAL's Legacy: 2001's Computer as Dream and Reality*, D.G. Stork, Editor. 1997, MIT Press: Cambridge, Massachusetts. p. 33-51.

eye movements to give early warning of tiredness and loss of concentration[452], and another currently under development monitors drivers' direction of gaze and warns them if they fail to notice warning signs, vehicles, or pedestrians[453].

Clearly, the ultimate stage of such developments as these would be a computer system with the mental expertise to act like a human agent, carrying out any tasks within its ability just as surely as a person would. As such, it might become known as a *mentalistic, psychological,* or *personal* user-interface—or simply as an *intelligent* one. Autistics, of course, might prefer the more mechanistic approach to the computer of existing user-interfaces because they have never fully acquired the inter-personal skills that such interfaces of the future might exploit. Nevertheless, most people would probably find such a development immensely appealing simply because it relied on abilities they had already acquired in interacting with other human beings and did not require them to master skills peculiar to the computer. Indeed, systems already exist which can understand commands like, "go to the second paragraph on the next page; select the second sentence; capitalize every word in this sentence; underline it..."[454]. Already, major companies use so-called *chatbots* on their websites or automated telephone answering systems. These are software agents which can carry on conversations of sorts with human enquirers, and clearly, once started down this road, such systems will be driven by the demands of their users to ever closer approximation to human conversational skills[455].

Another step towards greater mentalistic realism has been made by way of giving the computer system not merely a voice, but a face:

At Bell Labs, we have attached a talking face to our computer, which simultaneously sends the same information to the [speech] synthesizer and the talking head. Thus the talking head receives information about the phonemes and their duration and uses the information to compute the appropriate position of its lips, jaw, and tongue. It also moves its eyebrows to enhance stressed portions of the speech. Although the talking head in the picture is a flat mask, it can be covered by a textured face mask portraying any person you choose. The talking face not only makes the speech synthesizer more attractive and personable, it also enhances the intelligibility of the speech by letting the listener lip-read while listening to the computer.[456]

Lip-reading (strictly speaking, *speech-reading*) is greatly aided by the fact that utterances that are the hardest to distinguish by hearing are the easiest to distinguish by sight, and vice versa. Again, while talking, people are more likely to blink between

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[452] Luckhurst, J., *This is your wake-up call*, in *The Sunday Times*. 2004: London. p. 7.

[453] Ham, P., *There's a cyborg in the back seat*, in *Sunday Times*. 2004: London. p. 15.

[454] Kurzweil, R., *When Will HAL Understand What We Are Saying? Computer Speech Recognition and Understanding*, in *HAL's Legacy: 2001's Computer as Dream and Reality*, D.G. Stork, Editor. 1997, MIT Press: Cambridge, Massachusetts. p. 132-69.

[455] Graham-Rowe, D., *Even a chatbot can turn nasty*, in *New Scientist*. 2005. p. 26-7.

[456] Olive, J.P., *'The Talking Computer': Text to Speech Synthesis*, in *HAL's Legacy: 2001's Computer ad Dream and Reality*, D.G. Stork, Editor. 1997, MIT Press: Cambridge, Massachusetts. p. 101-130.

words than during a word, making visual detection of word-breaks possible by monitoring a person's eyes[457]. Given that normal speech is a continuous stream of sound without breaks between words, such cues are particularly useful to computer systems designed to understand speech.

The voice is also of course a major means of emotional expression, and voicemail software is already being developed called *Emotive Alert* which monitors volume, pitch, and rate of speech used in the first 10 seconds of a message. This is then compared with stored "acoustical fingerprints" which attempt to discriminate between urgent/non-urgent, formal/informal, happy/sad, or excited/calm messages. Emotive Alert is part of a broader trend to endow computers with emotional understanding, and remedy the fact that, in the words of one authority, "At the moment, communicating with machines is like an autistic experience". Endorsing the fundamental point I am making, he adds the prediction that "In the future, machines will know more about our emotions and respond in accordance with them"[458].

Where recognition of facial expression is concerned, computers can already recognize the six basic expressions of disgust, sadness, happiness, fear, anger, and surprise[459]. Recently an "emotional social intelligence prosthetic" system has been developed to monitor a person's expression and body language so as to be able to warn an autistic using it on a hand-held computer if the person to whom they are talking is showing signs of boredom[460]. Indeed, it is even possible that computers could out-perform human beings in certain respects where accurate monitoring of particular aspects of emotion is concerned. This is because there already exists technology which can monitor and interpret emotional responses, for example by directly sampling galvanic skin conductance—as used, for example, in so-called lie detectors. Given that people already interact with computers mainly by touch (via the keyboard, mouse, touch-pad etc.), it might be entirely feasible to include skinconductance sensors in such devices and thereby allow the operating system to directly measure the user's state of emotional arousal[461].

Additionally, an intelligent interface ideally would have to be able, not merely to monitor gaze, gesture and expression, and to comprehend language, but also to be able to draw on a wealth of experience of peoples' behaviour and commonsense, dayto-day knowledge. Developments that are already taking place suggest that acquiring such

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[457] Stork, D.G., *"I could see your lips move": HAL and Speechreading*, in *HAL's Legacy: 2001's Computer as Dream and Reality*, D.G. Stork, Editor. 1997, MIT Press: Cambridge, Massachusetts. p. 237-61.

[458] Biever, C., *You have three happy messages*, in *New Scientist*. 2005, 8 January. p. 21.

[459] Rosenfeld, A., *Eyes for Computers: How HAL Could 'See'*, in *HAL's Legacy: 2001's Computer as Dream and Reality*, D.G. Stork, Editor. 1997, MIT Press: Cambridge, Massachusetts. p. 212-35.

[460] Biever, C., *Please stop me if I'm boring you*, in *New Scientist*. 2006. p. 30.

[461] Picard, R.W., *Does HAL Cry Digital Tears? Emotion and Computers*, in *HAL's Legacy: 2001's Computer as Dream and Reality*, D.G. Stork, Editor. 1997, MIT Press: Cambridge, Massachusetts. p. 280-303.

contextual knowledge is by no means impossible for computer systems. Indeed, they suggest that the internet already provides most of the resources necessary to achieve the feat. According to a recent account, computers can learn the contextual meaning of words simply by use of a web-based search engine like Google, which already has more than eight billion web pages indexed. Contextual meaning can be inferred by the words that normally occur in conjunction with the target term. For example, googling "hat" and "head" together gets nearly 9 million hits by comparison with less than half a million for "hat" and "banana". Researchers at the National Institute for Mathematics and Computer Science in Amsterdam have developed a statistical measure of such associations, which they call the *normalized Google distance,* or NGD for short. The lower the NGD, the more closely the meanings of two words must be related, and by building up maps of such relationships, a computer system can infer the contextual meanings of words. The NGD technique has already been used to distinguish colours, numbers, religions, and Dutch painters, and, according to one of the researchers, could be seen as a way of making a computer understand things and act at least "semi-intelligently"[462].

Again, progress is already being made on what is perhaps the major short-coming where machines (and autistics too) are concerned: the appreciation of contextual meaning within particular expressions. Recently, software called *Sentiment* has been developed to monitor news coverage, reporting, and commentary on specific topics on the internet with a view to gauging its tone for interested clients such as manufacturers or political parties. Employing people to do this is a vastly timeconsuming and expensive operation, so automating the process makes sense: whereas a person can read 10 articles an hour, Sentiment can read 10 every second! However, the software has to be able to distinguish positive from negative comments not simply by which words are used, but by their context. Thanks to commonly used devices like irony, double negatives, and rhetorical questions—all features which cause great difficulty to autistics—the true meaning of a comment can often only be appreciated by analysing its context, and the new software is specifically designed to handle this aspect of the problem. Three human expert readers are likely to agree about an article's tone 85 per cent of the time, and Sentiment concurs about 80 per cent with their judgement, suggesting that appreciation of contextual meaning is no longer entirely beyond the reach of software systems[463].

Nevertheless, comprehensive mentalistic ability in this respect would demand so much computing power that it would probably be prohibitively expensive, and would leave little or none left over for what the computer was supposed to be doing for its human user. So in reality mentalistic interfaces of the future will probably settle for something less than complete proficiency, and the first ones will almost certainly be limited to one particular type of interaction, such as operating combat aircraft

[462] Graham-Rowe, D., *A search for meaning*, in *New Scientist*. 2005, 29 January. p. 21.

[463] Graham-Rowe, D., *Software agents give out PR advice*, in *New Scientist*. 2005. p. 24-5.

or managing the operating systems of personal computers. To this extent they may continue to appear somewhat autistic by comparison with normal human beings (but being machines rather than people this will probably not matter as long as they are sufficiently mentalistic to do the job). And of course, where personal computers are concerned, the genuine personal user-interface would always remain an ideal, guiding development of the systems in the direction of greater and greater general mentalistic proficiency and emulation of human beings. Nevertheless, a very significant start has been made. Perhaps the closest approximation at the time of writing is Saya the cyberreceptionist, whose voice-recognition technology is claimed to allow 700 verbal responses and "an almost infinite number of facial expressions from joy to despair, surprise to rage". Indeed, according to her inventor, she even "has a temper ... and she sometimes makes mistakes, especially when she has low energy"[464].

* * *

Clearly then, building computer systems that can mimic human beings in various respects is already well under way. Indeed, it has been a major aspiration from the beginning, and here the classic paper is one by Alan Turing (1912-54) in which he describes what he calls *the imitation game* as an objective way of answering the question "Can machines think?"[465]. Today this is called the *Turing test*. If you think in terms of the concept of mentalism as elaborated here, the point about a Turing test is that it is wholly mentalistic: the question is, can a human being, *using only mental means* tell the difference between a machine and another human being, interrogated in the same way. A person and a computer are, to put the matter another way, two *mechanisms* for producing responses which the adjudicator must distinguish using only the mental content of the responses, rather than any knowledge of their origin. As Turing himself put it, "the interrogator cannot demand practical demonstrations"[466].

In his classic paper, Turing approached the problem in a very different way from that suggested here. Knowing nothing of modern computer interface technology, he speculated about trying to emulate human minds directly, and suggested simulating a child's mind as a first step. If the simulated child's mind could then by educated in the way in which a real child might be, the desired adult mind might result. However, research into autism suggests a completely different, and much more promising approach. This is to break down the mind—or rather mentalism, as I am calling it—into its critical parts: monitoring of gaze and interpretation of intention, attribution of agency, appreciation of false belief, episodic/autobiographical memory, and so on, and to reproduce these in software as a new kind of interface. Given that the first mentalistic user-interface might indeed be considerably "autistic" in having serious limitations in most of these departments, full, adult mental capability embracing all aspects of the

[464] Faiola, A., *Japan embraces new generation of robots*, in *The Washington Post*. 2005.

[465] Turing, A.M., *Computing Machinery and Intelligence*, in *The Essential Turing*, B.J. Copeland, Editor. 1950, Clarendon Press: Oxford. p. 433-464.

[466] Turing, A.M., *Computing Machinery and Intelligence*, in *The Essential Turing*, B.J. Copeland, Editor. 1950, Clarendon Press: Oxford. p. 433-464.

mind would certainly not be possible to begin with. Nevertheless, a start would have been made, and Turing's question of whether machines can think would be posed, not by a system that directly attempted to mimic a complete human mind either in a child or in an adult, but by one that used critical aspects of human mentalism to communicate with its human users. It would be what you might call the *modular* or *functional* approach to the Turing test, rather than the developmental and anthropomorphic one envisaged by Turing himself—and would certainly be much more practicable. To revert to his symbolism, you could say that it would attempt to simulate not so much the mind of a normal child as that of an autistic one.

An example of this much more productive, modular and functional solution to the problem of whether machines can think might be the question of consciousness. For Turing's anthropomorphic approach, this would probably have meant interrogating the machine at a high-flown philosophical level, and considering wholly abstract issues, much as philosophers do. However, a much more practical point which will inevitably arise if software engineers do indeed pursue the goal of a mentalistic userinterface for computers is this: would users want their computers to appear to be conscious, or able to think for themselves? Given that developing the software and hardware to provide such abilities might be expensive and time-consuming but the pay-offs for doing so possibly very great, the question at least deserves to be considered seriously.

If a computer could communicate verbally with its user, and if it could indeed act as an independent agent in the ways suggested above, then exchanges of the following kind would inevitably occur. For example, you might ask your computer if it had found the data you requested it to look for on the internet, and it might reply that it was sorry, but that it had not yet done so, but hoped to complete the task in a defined time. In order to do this, the computer would be acting as an independent agent with knowledge of its own programming and outputs. It would be conscious of what you wanted it to do for you, at least in the sense that it could be said to have registered your verbal request and acted on it just as a person might. Again, it could also be said to be conscious of its own self because it had shown that it could report the status of its current operations correctly just as it could that of other entities it might encounter, such as other software agents, or human beings. Furthermore, it would probably do so in polite, grammatical English, and with due regard to the state of mind of its user. Laboratory studies show that users enjoyed playing a glitchy computer game that apologized for its failures more than they did one which simply informed them of their mistakes. So politeness clearly pays where winning the approval of users is concerned, and this would of course be a major selling point in favour of a mentalistic user-interface: it would know when and how to apologize and—unlike actual human beings—would probably do so with punctilious correctness each and every time it needed to[(467)]. Such a system might do very well in a Turing test, and many people might say that, to this extent at least, your computer could think for itself

[(467)] Biever, C., *Polite computers win their users' hearts and minds*, in *New Scientist*. 2004. p. 20.

and had a measure of consciousness of what it was doing. And of course, if mentalistic userinterfaces of this sort actually do begin to appear, these are exactly the kind of responses that users would want to have from them, and presumably are the very ones that software engineers will strive to provide.

But previous chapters have shown that there is much more to human interaction than just replying appropriately to particular questions. What about what has been called "the acid test" of mentalism: false-belief problems of the pencil-in-the-sweet-tube/Sally-Anne type (see above pp. xx-xx)? Here, again, the answer must be affirmative, because to do its job properly, the computer would have to appreciate both the knowledge and the ignorance of its user. Ideally it would be able to interpret this for itself, for example in only offering assistance when the user needed it, or only requesting information which the user actually possessed. This would definitely require the software system to keep a track of its user's state of knowledge about particular topics, and ideally to be able to predict the future evolution of it. For example, suppose the mentalistic interface was programmed to remind its user of certain dates and the appropriate action to be taken on them, such as meetings or anniversaries. Constant reminders would be irritating, and so the system might be designed to monitor the user to see if they were in fact going to remember the event, and only intervene when it became clear that they had not. So the system might not mention an impending wedding anniversary if it saw the user ordering flowers and booking a restaurant, but would be certain to do so in good time if it did not. Again, to avoid being intrusive the system might not wish to confirm the users' knowledge every time they proved to be correct about something. But the system would have to be able to detect and interpret a false belief of its user, and be able to take appropriate action to correct it, at least where its own operations were concerned—and almost inevitably, more generally. In order to be able to do this, the intelligent user-interface would need to reliably monitor, interpret, and predict the state of mind of its user and would certainly have to be able to pass a classic Sally-Ann test, at least if administered in an appropriate form and in the context of the computer's normal area of expertise (however circumscribed that might actually be).

But what of other mentalistic abilities, such as autobiographical memory? At the very least, a truly personal user-interface would need the equivalent of an episodic memory simply because of its presumed ability to act as an independent agent. As such, it would have to be able to distinguish between events which had occurred by its own initiative and those which the user or some other agent had initiated. To take a very simple illustration: internet software normally records the chronological history of a user's visits to websites, and a system where the computer could itself initiate visits would need to record those too. And just as in human episodic memory, such a history would have to link the event to the agent responsible for it, be it human user or computer system. Indeed, a start has already been made—at least in respect of profiling the behaviour of individual users of smart-phones. Message-logging software appropriately named *Context* is being used as a basis for a system that can learn

about its user's behaviour, preferences, and habits, and apply the resulting database to predict the user's future likely actions, and perhaps ultimately to offer intelligent advice—for example, by reminding the user of something they had forgotten, or warning them in advance about something they may wish to do. The software can also be used for so-called *reality mining:* enabling a user to compile statistics, summaries, and analyses of what they have been doing. Although in its infancy, such capabilities would be a fundamental building block in creating truly intelligent computer agents with their own episodic memories: those which could not only log and process data, but use it to gain new insights into their users'—and ultimately perhaps even into their own—behaviour[(468)].

As a result of developments like this, the computer would build up its own independent episodic memory, and presumably be able to report relevant parts of it to its user if and when appropriate. If words were the medium of communication— which they almost certainly will be—the computer system would say something like, "I did this today," or "I was not able to do that yesterday," exactly as a human being would, and these would indeed be instances of episodic memory. Indeed, when summed over the lifetime of the operating system, such memories would amount to something of an autobiographical memory—particularly when the system was required to summarize its own history, perhaps in introducing itself to a new user.

A similar argument applies to the use of mentalistic terminology in general. At first sight, it might seem bizarre that a computer should talk in terms of its or even its user's intentions, wishes, feelings, moods, or whatever. But in reality, it would be almost impossible to avoid use of mentalistic expressions like these in verbal communications between user and computer. Examples from every-day life would be saying that a car *didn't want to start*, that *nature knows best*, or that something you ate *did not agree with you.* Clearly, wanting, knowing, and agreeing are all mental acts and properly speaking can only be attributed to human beings. But despite this limitation, we find it more or less impossible not to speak and to think in this way. Indeed, this happens even when we know full well that such mentalistic expressions are purely metaphorical, and that the thing to which they are referring is not and never could be considered an agent in the way in which a human being normally can be: in other words, one endowed with intention, consciousness, and motives. Yet we nevertheless constantly talk about inanimate objects, machines, and natural phenomena as if they were mental beings who could be credited with such attributes, for example when we describe a wayward object as *having a mind of its own* Clearly computers are no different, and at the very least, a genuinely intelligent user-interface would have to be able to understand such mentalistic terminology when its user spoke it.

Furthermore, the system would probably require the user to give the interface system a name so that it knew when it was being spoken to, and the use of everyday names also given to persons would be almost unavoidable. The user would be strongly inclined

[(468)] Biever, C., *The phone that knows you better than you do*, in *New Scientist.* 2004. p. 21.

to personalize the user-interface further by using personal pronouns in addressing it, for example in asking questions like "Have you done that yet?" or "Where is your copy of this?" You could express such questions non-mentalistically and objectively, avoiding personification, personal pronouns, and reference to the system as an agent, but most people would have to think before doing so, and find it long-winded, pedantic, and unnatural. Indeed, an attempt made in the hey-day of behaviourist anti-mentalism to avoid mentalistic description of chimpanzee behaviour at the Yerkes primate laboratories ended in complete failure with the admission that "All that resulted was an almost endless series of specific acts in which no order or meaning could be found"[469]. Much the same would be true of interacting with an intelligent computer, and clearly it would be altogether easier to speak to a machine which was designed to mimic many human mental functions as if it were in fact a person, and to use the full range of mentalistic expressions that might be appropriate. Such terminology would certainly include personification, and it would be difficult to avoid references to the system's cognitive state as if it were a mind, with knowledge, intensions, memories, and so on. Clearly, such usages would give a whole new dimension of meaning to the term *personal computer*.

In social interaction between two people, mimicry and mirroring of each by the other increases rapport and feelings of solidarity. Where pets are concerned, people usually find dogs much more responsive to them than cats, and birds like parrots are appreciated for literally repeating—parroting—what their owner's say. Research into reactions of people to robots suggests that in the case of machines too, people respond much more positively to a system that actively imitates them. In a recent experiment to see if computers could establish rapport with their users, an animated character appeared on the screen with speech skills equivalent to those of a one-year old child. The user had to make toy animals out of building blocks displayed on the screen and teach their names to the animation. In response, the animated character mimicked the speech sounds of the user to a varying extent. The users then rated the character in terms of co-operation, learning ability, task-achievement, comfort, friendliness, and sympathy. The animation scored highest on these measures of social compatibility when mimicry was about 80 per cent. The researchers reported that the 20 per cent of the voice not mimicked seemed to give the users a sense of the character having some degree of free will—just like another human being.[470].

But clearly, if such results can be obtained with a one-year-old's level of language development, much greater acceptability is likely to be achieved with systems that can approximate much more closely to adult speech. In this situation, making the machine sound as similar to the user as possible would be bound to include a full use of mentalistic mannerisms, such as personification, emotion, and attribution of

[469] Hebb, D., *Emotion in man and animal.* Psychological Review, 1946. **53**: p. 88106.

[470] Ananthswamy, A., *Mimicry turns computers into everyone's best mate*, in *New Scientist.* 2003. p. 17.

intention and meaning. Furthermore, if such systems could be successfully engineered, their appeal and acceptability to users might be greatly enhanced (and if so, would certainly justify the expense of developing them). The result might be that the system was personal not only to the extent that it seemed to respond like any human being in general, but personal to the extent that it actually appeared to resemble its user in particular ways. In other words, we would have not just personal computers, but *personalized* ones.

Where the manipulative, evaluative, and sanctioning aspects of mentalism are concerned, you might at first think that these at the very least would be inappropriate. Surely, no one would design a computer system to monitor, censor, or control a person's behaviour in the way in which we routinely use mentalistic terminology to do so when we talk in terms of right and wrong, guilt or innocence, justifiable or reprehensible behaviour? Surely a computer's user-interface, no matter how mentalistic, would never be called upon to name, blame, or shame its user (see above pp. xx-xx)! Nevertheless, experiments featuring a public-goods game have shown that people act more in the public interest when they can see an image of a robot with large eyes apparently watching them, even though the robot can not in fact see them[471]. This suggests that if intelligent computers were to have the equivalent of eyes (for example, to monitor users' direction of gaze or read their lips as suggested earlier), then such systems would already probably be subtly influencing their users' responses in a more socially-responsive direction, even if the users themselves were unaware of the fact.

Furthermore, any competent mentalistic user-interface would have to be able to point out errors and omissions to its user, and although these would certainly be very politely expressed, they could be the thin end of what could become in the right circumstances a very thick wedge. Already users of many on-line systems find that their responses are automatically inspected and vetted before being accepted by the system. In one I use for writing references for students for example, a so-called Inspector (actually, of course, a soft-ware agent) has to approve the submitted reference and often asks for further details before stating that my reference has passed its tests and been accepted. Again, systems controlled by employers are inevitably made to conform to company rules, and these usually extend to what users are allowed or not allowed to do with their work-stations. If and when users infringed these rules, a system with a mentalistic interface would probably inform them of the fact, and certainly report the violation to the system administrator. Other systems could be required to vet the language of the user, not merely for grammatical errors and verbal solecisms, but for so-called "sexist" or "racist" language—or any other infringement of what the powers controlling the system regarded as proper selfexpression. Indeed, like ecclesiastical censors of the past, such systems might have to give their *imprimatur* ("let it be printed") before emails could be sent or hard copy prepared, and if directly quizzed by the user about the acceptability of something would reply with the equivalent of the

[471] Woods, V., *Pay up, you're being watched*, in *New Scientist*. 2005. p. 12.

other necessary permission of the ecclesiastical censor: *nihil obstat* ("nothing against it"). Here would be an actual machine "criticiser" of the kind intuited in himself by Joey, Bettelheim's "mechanical boy" (see above pp. xx-xx).

The result very easily might be that mentalistic user-interfaces became not simply agents of their users, but agents of the organization, police, or state, and would certainly be ideally placed, both to sanction and to report misdemeanours on the part of their users. Indeed, users might find them even more intrusive, vigilant, and unforgiving than any human being! Certainly, appropriately programmed personal user-interfaces could become an embodiment of thought-policing without parallel and could give the acronym *PC* a distinctly double meaning: suggesting not just *personal computer*, but *politically correct* at one and the same time. Clearly, the truly PC PC could be a product with a great future, and PC might seem to some to be the appropriate title for their PC PC (in other words, Police Constable Politically Correct Personal Computer)!

But joking apart, nowadays it has become an indictable offence to pay for services from certain websites, and merely accessing others might be construed as similarly culpable. Any competent intelligent interface would have to be able to warn its user if they appeared to be about to access such forbidden sites, and might also be programmed to deny access if the user persevered—for example to material deemed politically unacceptable or pornographic. Indeed, software is already routinely used to restrict the access of children to websites, and a mentalistic version of this would certainly appear—at least to children—to be playing the role of parents or police. Some service providers already police chat-rooms by having human moderators supervising them, and it is not difficult to see how, with the inevitable growth in such sites and advances in technology, software agents might begin to take over part or even all of their role.

Already there are claims that a software agent called *ChatNannies* has been developed to search internet chat-rooms for evidence of paedophiles who may be trying to groom children for later sexual exploitation. Each agent is called a *nanniebot*, and thousands of them log onto different chat-rooms and strike up conversations with users. If a nanniebot detects something suspicious, it alerts an operator, attaching an email of the conversation and the email address of the suspect. Clearly, in order to work effectively, the nanniebot must be taken for a real person by those with whom it interacts, and the designer of the system claims that in conversations with two thousand chat-room users no one had rumbled his robots[(472)]. If such claims are credible (and this particular one has been seriously questioned:[(473)]), it suggests that we already have one situation in which a computer has passed the Turing Test—at least in so far as it applies to chat-room conversations purportedly with children. And where policing the internet in general is concerned, there will probably be no real alternative to such software agents simply because the sheer volume of communications is so vast.

[(472)] Graham-Rowe, D., *Software agent targets chatroom paedophiles*, in *New Scientist*. 2004. p. 23.

[(473)] New Scientist, *ChatNannies' AI credentials still on hold*, in *New Scientist*. 2004. p. 23.

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Nevertheless, there does seem to be one respect in which people and computer systems—no matter how mentalistic the latter may become—are completely different. This lies in the consideration that a user can always pull the plug or trash the machine, but cannot do the equivalent to a person—or at least, cannot do so without inviting a charge of violent assault or murder! In short, people have rights, computers don't.

But true as this may be, it would nevertheless be naive to imagine that computer systems might not acquire some degree of legal protection from arbitrary shut-down, intentional damage, or modification by their users. If such systems were indeed exercising some kind of legalized surveillance or control of their users' output, you would certainly expect them to be protected in some way or another from tampering which could compromise those functions. Genuinely personal computers might perhaps have no such protection, but institutional or company machines and those running government programs would certainly be protected from users in this way. Indeed, such protection already exists at the network or central system level where it is normally only the system managers and not the users who have the authority to modify or to shut down the system as a whole. Even though individual users may have freedom to use their work-stations, they often do not have the privilege to install or re-configure significant software, or to make important changes to critical system settings. And where privately-owned and operated PCs are connected to the internet and use services provided by outside organizations they are of course subject to regulation and control by them in much the same way.

Certainly, pilots, for example, would be committing a serious criminal offence if they tried to alter officially approved flight-control software—and certainly if they tried to shut it down in flight without good reason. (Nowadays this is often impossible in practice, because aircraft are controlled by fly-by-wire software systems which lack physical links between the pilot's controls and the flight-control surfaces, so turning off all the computers is not an option.) Systems that have built-in safety functions (for example, to prevent over-stressing of the airframe by pilot inputs, or to prevent stalling or flight into the ground) are in their own way as sacrosanct as the rights of any individual human being where arbitrary curtailment or modification of their application is concerned. And quite apart from legal considerations, practical reality effectively treats the systems concerned with respect equal to those you would accord to other human beings, as the following quotation from an airline captain suggests: "You never know exactly what will be the result of flipping a switch or setting a new parameter, so we don't interact with [the automation] during automatic landing. We simply don't know what it will do"[(474)].

In other words, while it would be absurd to claim that computers could have rights and privileges comparable to those of real people, it would be naive to regard all

[(474)] Degani, A., *Taming HAL: Designing Interfaces Beyond 2001.* 2003, New York: Palgrave Macmillan. 312.

such systems as merely mechanical and as subject to the arbitrary whims of their users. To this extent, pulling the plug even of a truly personal PC might not be as straightforward in the future as it seems today. Indeed, and irrespective of any legal considerations that might apply, if PCs actually do begin to mimic their users, some users at least might find it genuinely difficult to arbitrarily terminate something that might increasingly come to seem like an extension of their own selves. If this were to come about, the ultimate proof of the success of mentalistic interface technology would be the beginnings of a movement to credit computers with minds and rights comparable to that already seen in relation to animals. Indeed, if this line of reasoning is correct, intelligent computer systems' rights could become as controversial an issue in the future as animal rights have done in the recent past.

But however that may be, the preceding discussion seems to have established one unambiguous difference between the human user and the mentalistic machine. This is the consideration that whereas humans could indeed be held to account for their actions, and even prosecuted for them, it would seem that machines could not. Here surely is the essential difference: machines cannot have self-determining, sovereign consciousness in the way in which a human being does. In other words, people have conscious free will, computers don't. To put the matter in terms of the paradigm being developed here, you could say that it was the difference between mechanistic cognition equated with the machine and mentalism as identified with humans. Machines like computers and systems like interfaces might acquire mentalistic skills, but no one doubts for one moment that they are deterministic mechanisms—indeed, machines designed and made by human beings. Humans, on the other hand, are mental agents in their own right. And even if you take the view that human beings are just very complicated, biologically-evolved mechanisms without true free will, everyone would agree that people are not machines in the deterministic way in which computers are.

Nevertheless, in interacting with an advanced mentalistic user-interface whose medium of communication was language and which perhaps mimicked the usages of the user, users would have to speak to the machine as if it were a person like themselves, and this would include verbal commands. Many of these would doubtless be direct and indistinguishable from those you would expect to give to a machine, but some inevitably would not be. For example, suppose you gave your PC a command that it could not carry out. Being a mentalistic user-interface, it would respond with a polite refusal—perhaps pointing out that it did not have the time, capacity, or permissions to complete the task you had requested. In circumstances like this, the immortal words of Hal, the computer system in the film, *2001: A Space Odyssey,* might spring to mind: "I'm sorry Dave, I'm afraid I can't do that!" Dave's response was to try to argue with Hal in much the same way that he would have done had Hal been a person. Hal certainly acts in the film like a person who is being capricious or stubborn and has decided something of their own, sovereign free will. The reason that this seems credible in the film is that Hal does indeed have the discretion to do or not do what is being asked of it him, and the only medium of interaction through which

this discretion can be negotiated is that of language (Dave is marooned outside the space-ship Hal controls at the time and cannot open the door).

Any advanced mentalistic PC would probably be much the same in this respect, and as long as user and PC communicated via language, the user would have to act as if the PC had not merely a mind of its own, but discretion about what it did. In practice, this would credit the computer with what amounts to free will because in the circumstances in which a user like Dave might find themselves, no other method but negotiation and appeal to the system might be possible. So users would have to ask the system to do something, try to change its mind if it refused, and probably put up with it if they failed.

In the film, of course, Dave soon gives up on the verbal approach and resorts to more drastic measures: shutting down Hal's circuits (after successfully breaking into the space-ship). At this point it is Hal's turn to resort to verbal pleas with just as little effect as Dave had earlier. But Dave's final recourse to mechanistic intervention only underscores the point that mentalism is an independent system, not merely of communication, but also of command and control. We use mentalistic terminology to try to command and control the actions of others (usually through polite requests) and in doing so impute to them free will—for example, when we thank another person for doing something we requested. Thanking them recognizes the fact that they need not have done what we asked, but agreed to do so, thereby proving that they were free to do it. However, like Dave in the film, we can also often resort to more mechanistic measures when mentalistic ones fail, for example in making a recalcitrant child do something that we had previously only requested, or resorting to physical force in trying to restrain someone who cannot be restrained in any other way.

Dave and Hal play a game of cat-and-mouse when it comes to who is in control, and although Dave ultimately wins, the drama is as real as if Hal were indeed another person—particularly so because it seems as if Hal is completely in control at the beginning. Another, more general cat-and-mouse scenario might be that of a fugitive and his pursuers, and consideration of this gives some further insights into why belief in conscious free will is such a fundamental aspect of mentalism and why it is unlikely to be possible to deny it in practice to machines.

Let's begin by making the reasonable assumption that the pursuers have limited resources and cannot cover all possible sites for apprehending the fugitive, and that the fugitive can only be in one place at a time. The fugitive, by definition, is free. Indeed, he is determined to be free—but how free? And in what sense is he free?

In principle, the fugitive may seem completely free, but suppose the pursuers know that the fugitive is likely to resort to A with the highest probability (his home, say), B with less probability (his family perhaps) or C with less likelihood still (for example, acquaintances), and so on, with decreasing probability for each subsequent suspected place of refuge. If the fugitive thinks for a moment, he immediately realizes that the pursuers will think this. In other words, he becomes *conscious* of what they might do, and in practice exercises normal mind-reading skills—something an autistic would not

do at all, or only do with difficulty. What this means is that the fugitive instantly sees that, wherever he goes, he is *not* free to visit A, almost certainly not B, and probably not C either. However, knowing that his pursuers cannot cover all possible sites at one time, he might decide to go to some very improbable ones, say X, Y, or Z. But there again, he might reflect that, if he is sure his pursuers will foresee that he might think this, he might consider A, B, or C after all on the premise that, since he is expected to go there first, they will not look for him there if they anticipate his reaction to their reaction. Nevertheless, the fugitive cannot rule out his pursuers foreseeing this in its turn and therefore continuing to search for him at A, B, and C— which once again suggests somewhere like X, Y or Z...

Clearly, our fugitive is not completely free, but constrained by his pursuers—at least if he wishes to retain his freedom! The pursuers are certainly free to search for him wherever they wish, but they are also constrained by their expectations of where he might go. But neither has any more than very uncertain knowledge about the other, and knows that what each does in response to the other is constrained by what each thinks the other knows, and thinks the other knows about what they know, and so on, potentially *ad infinitum*. . .

Three important points need to be made about this situation. First, "freedom" is a relative, mentalistic term, meaning different things in different contexts: the fugitive by definition is "free" because he is no longer a captive, and also "free" to decide where to hide. Nevertheless, his freedom is constrained by his desire to stay free, and is to that extent determined by his situation. Second, what the fugitive is free to do is further limited by his consciousness of the situation: what he thinks his pursuers think—and by what he thinks they think that he thinks, and so on. This is essentially a Sally-Anne situation, one in which the fugitive and the pursuers' actions are constrained by their beliefs about the other's beliefs. Third—and most important for the present argument—with the precedent of *2001* in mind you could substitute a computer for either party and (assuming it had sufficient intelligence and was programmed appropriately) find that it behaved in much the same way as a human agent would: evading its pursuers by anticipating where they would search if it were playing the role of the fugitive, or trying to trap the fugitive by anticipating where he would hide if playing the role of the pursuers. But in either case, the computer's choices would be as unpredictable and as open as any human's. And the reason would be the constraints of the system: because the fugitive wishes to remain free, his actions must seem unpredictable to the pursuers and therefore free to that extent; and because the pursuers wish to apprehend him, their search must be free to the extent that he must assume that they may search anywhere they think he is likely to be found. Indeed, computers playing both roles would inevitably exercise similar freedom of choice, and to that extent, such systems would be as free as human agents ever are in such situations. And of course, to the extent that such systems would have to be able model the belief of their antagonist and take account of their antagonist's beliefs about their own beliefs,

they could be described as exercising some measure of conscious freedom of choice in exactly the same sense in which a person would.

Although such cat-and-mouse situations are the stock in trade of fictional works like *2001*, one reason why they are so perennially popular may be that they are so accurately portray the reality of mental interaction. This is because what I as a conscious mental agent can determine about others' intentions and future actions is constrained, not only by what I think they know, but by what they might think I know about what they know, giving rise to considerations regarding what I know about what they know about what I know, and so on. The extra layers of complexity which taking into account others' reactions to your own mental state introduces makes the prediction of others' behaviour so difficult and so contingent that regarding them as mental agents with conscious free will is in practice unavoidable and in principle a welcome simplification. In short, if you cannot reliably predict another person's behaviour because the causes are so complex, you might just as well regard it as unpredictable! But at the same time, you cannot simply consider others' behaviour as random and meaningless, because this would be to ignore their mental states altogether and result in you behaving like an autistic in this respect. Instead, you have to both respect others as mental agents in their own right, and also allow them the freedom to act in ways which you can seldom completely control and often not completely predict or perhaps even understand. The result is that mentally you have to accord others conscious free will and respect them as independent agents of their own destiny. Our belief in human freedom is essentially a conclusion forced on us by the necessity of seeing other people's behaviour as essentially unpredictable, but nevertheless motivated. And the role of the other person's mental awareness of others in contributing to their behaviour confirms us in our justified view that people are conscious mental agents, able to choose an outcome knowingly, even if ultimately unpredictably.

* * *

Nevertheless, there is one final difference between mentalistic machines and human beings that most people would think was definitively and absolutely different: people have an unconscious mind, machines do not. As a result, people can be capricious, irrational, and unpredictable in a way that machines cannot be. Whoever heard of a computer being psychoanalysed, or software analysts needing to study Freud! But once again, things are not what they seem, and the difference—if there is one—turns out to be more academic than real.

An important aspect of existing computer user-interfaces that has not been discussed so far is the question, not of what they are designed to do, but of what they are designed *not* to do. As I said at the beginning of this discussion, it is because computers work in ways quite different from human brains that a user-interface is needed in the first place, and one of its most important functions is to hide the true workings of the machine behind a facade that neither distracts nor challenges the user. Indeed, there are files and processes that are so fundamental and central to the computer's operating system that not only is it important to hide them from users, it is also neces-

sary to ensure that users cannot normally alter them in any way, simply because to do so would almost certainly cause the computer to crash. So these core system files are protected from witting or unwitting interference by being made effectively invisible to users, along with most of the rest of the system's functioning.

Furthermore, this is true of all machine-human interfaces (often frustratingly so for the user with examples like video recorders or controls of air-conditioners and other such systems in mind). This is because interfaces and related user-manuals are always a reduced, or abstracted description of the machine's behaviour. No interface provides a complete description of the underlying functioning of the machine, and neither does the human mind. On the contrary, it too is completely reduced and abstracted. The mind itself is an abstraction and mentalistic terminology uses abstract nouns such as *knowledge, belief, desire, hope, intention, motive, love, hate, guilt, justice, desert, consciousness, righteousness, redemption, obligation,* and *culpability;* verbs like *think, feel, intend, believe, foresee, wish, know* and *understand*; and adjectives like *good, bad, moral, immoral, right, wrong, true, false, evil, criminal, human,* and *divine*—every one an abstraction. No wonder autistics like Temple Grandin protest that normal people's thinking is too "abstractified"!

However, we seldom realize why the mind and its imputed contents are abstracted, and we do not often link those abstract mental entities to the mechanism underlying them: the brain. But clearly, the mind is abstract for essentially the same reason that machine interfaces are. The equivalent of the machine in the case of the mind is the brain: an entity with billions of component parts which work together to produce what is probably the most complex single system on Earth—and quite possibly in the entire universe. No man-made mechanism has ever begun to approach this level of complexity, so if mere machines need reduced, abstracted interfaces for their human users' benefit, how much more reduced and abstracted must the brain be in the form of the mental interface we call the mind! The answer is: if the brain represents the ultimate in complexity, the mind correspondingly is the quintessence of reduction and quite literally the mother of all abstraction.

But this is just the start of it:

There is a basic and fundamental notion in the world of automated machines and software design that is used to characterize the ... user interaction problem... It is called *non-determinism*, and refers to a system that behaves in a way that cannot be determined. The machine's responses, from the user's point of view, become unpredictable. They confuse us, and therefore, at times, are quite dangerous.[(475)]

The reason, of course, is that we are considering things from the user's point of view, *not* that of the designer:

... in many cases, when you look from the outside—from the interface side, that is— you realize that you are not provided with *all* the necessary information. You are

[(475)] Degani, A., *Taming HAL: Designing Interfaces Beyond 2001.* 2003, New York: Palgrave Macmillan. 312.

blind to what goes on inside the machine, and therefore the machine "appears" non-deterministic. Capricious is the term people would use.[476]

I found a striking example on the control panel of an air-conditioner which advises the user that when a certain symbol is displayed "on/off, temperature settings, and timer operation etc. are sometimes impossible to control"!

In other words, the very fact that a machine is mechanically determinate in its inner workings does not mean that it will seem that way to people who have to interact with it. On the contrary, from the user's point of view, a machine can be as capricious and as unpredictable as any person might. Furthermore, if we recall our innate ignorance of what goes on in our own brains and bodies from a purely mechanistic point of view, we can see that the same principle applies. Our own mental and physical machines, so to speak, will appear non-determined—and even capricious—to us for the same reason: we simply do not know what is going on at that level, and so our interface with our own brain and body—our mind—is indeed blind to most of what goes on inside the machinery of our own selves. In other words, autistics may indeed by mind-blind, but everyone is *brain-blind*. Furthermore, when looking at things from the ultimate, evolutionary point of view, there are very good reasons why this should be so.

As the evolutionary biologist (and principal American colleague of Hamilton) Robert Trivers puts it: "The most important thing to realize about systems of animal communication is that they are not expected to be systems for the dissemination of truth." On the contrary, he goes on to point out that they are expected to be systems by which individual organisms attempt to maximize their biological self-interest by communicating to others things that may be true or false. Examples might be camouflage (as in prey and/or predators); deceptive communication (as in insects who use mating calls to catch prey); or exaggerated signalling (as in hatchling birds, who, experiment shows, will beg with exactly the same widest possible gape whether they are hungry or have their throats already full of food). Trivers continues,

With the advent of language in the human lineage, the possibilities for deception and self-deception were greatly enlarged. If language permits the communication of much more detailed and extensive information—concerning, for example, events distant in space and time—then it both permits and encourages the communication of much more detailed and extensive misinformation. A portion of the brain devoted to verbal functions must become specialized for the manufacture and maintenance of falsehoods. This will require biased perceptions, biased memory, and biased logic; and these processes are ideally kept unconscious.

He adds that of particular importance to such dishonesty is the self-deception that it automatically tends to generate. Since it is useful to maintain a facade of morality and public beneficence, deception must be disguised—increasingly, even to the actor himself: "The actor becomes less and less conscious of the true nature of his actions,

[476] Degani, A., *Taming HAL: Designing Interfaces Beyond 2001*. 2003, New York: Palgrave Macmillan. 312.

and this self-deception induces a range of impaired learning that may have costs far removed from the initial acts generating the impulse towards self-deception..."[477].

If lying can pay—and what honest person doubts it can?—detecting lies becomes critical. Research has shown that lying can often be detected by so-called *leakage cues*. For example, the fact that the voice is tied to the areas of the brain involved in emotion, means that it is very difficult to conceal some of the changes in the voice that occur when emotion is aroused. One of the best-documented vocal signs of emotion is the pitch of the voice. For about 70 per cent of people who have been studied, pitch becomes higher when the subject is upset. Studies show that pitch also rises when the subject is lying, probably as a result of the anxiety about detection that the deception induces. However, unusual flatness in the voice can also conceal deception, perhaps by way of compensation for this effect.

But the sound of the voice is not the only source of clues about the truth or falsity of what a listener is hearing. The face can also give away a lot. Here smiles are an excellent example, and there is a subtle but important difference between a false and a genuine smile. In the genuine smile, muscles around the eyes contract, causing visible creases, as Darwin noted. But the muscles in question cannot be voluntarily contracted in a false smile:

five-month old infants show the eye-muscle smile when the mother approaches, but a smile without the eye muscle when approached by a stranger. When the eye-muscle smile is shown the pattern or brain-activity found with genuine enjoyment occurs, but that brain activity pattern is not found when the smile alone is shown. Happily married couples when they meet at the end of the day show eye-muscle smiles, while unhappily married couples do not show the eye-muscle activity when they smile at each other[478].

The result is that insincere smiles tend to be somewhat exaggerated by way of trying to produce the wrinkles around the eyes characteristic of a sincere one through stretching the mouth into a more emphatic smile than would be the case if it were sincere.

Body language is also a good source of clues to deception: "Liars usually do not monitor, control and disguise all of their behaviour. They probably couldn't even if they wanted to. It is not likely that anyone could successfully control everything he did that could give him away, from the tips of his toes to the top of his head"[479][480]. If this is so, Trivers's point is that the most effective liars are likely to be those who do not know that they are lying. Totally unaware of their own deception because they sincerely

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[477] Trivers, R., *Sociobiology and Politics*, in *Sociobiology and Human Politics*, E. White, Editor. 1981, Lexington Books: Lexington, Ma. p. 1-43.

[478] Darwin, C., *The Expression of the Emotions in Man and Animals*. Third Ediction ed, ed. P. Ekman. 1998, London: HarperCollins.

[479] Ekman, P., *Telling Lies: Clues to Deceit in the Marketplace, Politics, and Marriage*. 1985, New York: W W Norton.

[480] Wilson, D.H., *How To Survive A Robot Uprising: Tips On Defending Yourself Against The Coming Rebellion*. 2005, London: Bloomsbury. 178.

believe their own lies, they are less likely to give the truth away in leakage cues. But of course, other individuals will also be the victims of such deception, so Trivers speculates that there may have been evolutionary escalation between the ability to deceive others in your own self-interest and the corresponding ability to detect deception in others when you are the victim. The result of such an evolutionary arms-race might be that "As mechanisms of spotting deception become more subtle, organisms may be selected to render some facts and motives unconscious, the better to conceal deception ... the organism is selected to become unconscious of some of its deception, in order not to betray, by signs of self-knowledge, the deception being practised." Trivers concludes, "The mind must be structured in a very complex fashion, repeatedly split into public and private portions, with complicated interactions between the subsections"[481].

Admittedly, you would not want your personal computer system, no matter how intelligent and mentalistically competent it may be, to deceive you, but even here there is an arresting parallel with the design of such an interface. Suppose an intelligent computer system had more than one user, or sent outputs to more than one recipient—something more or less unavoidable in today's highly integrated world. Multiple users would each need their own secure passwords or biometric data to ensure privacy and security. For example, users might trust such a system with their credit card details, but only if they were sure that their personal data were completely secure and secret. In order to achieve this, the system would have to compartmentalize its data base along the lines suggested by Trivers in my last quotation from him: "structured in a very complex fashion, repeatedly split into public and private portions, with complicated interactions between the subsections". Indeed, where confidential data on really controversial personal matters was concerned, the system would probably need to balkanize its self-awareness in a manner exactly comparable to ways in which Trivers suggests people do: in other words, not simply denying you know something, but doing so convincingly because you no longer know you know it. So, for example, a really confidential data file relating to subject X and belonging to user A might be completely off-line to the system when user B was logged on so that B could not discover indirect evidence of it by asking the system if A had any files relating to X. A really secure system would need, not only to keep A's files closed to B, but also to keep the complete directory of closed files secret since even admitting the existence of a file relating to X could be a serious breach of security. The result would be a closed, off-line computer "unconscious" closely comparable to the human one as far as safeguarding suppressed information was concerned. Indeed, to this extent, such systems could be said to be self-deceptive in much the same sense that Trivers suggests the human mind has evolved to be.

But admittedly, when it comes to self-deception in the interests of deceiving others, intelligent computer systems of the future will doubtless resemble autistics in what

[481] Trivers, R., *Sociobiology and Politics*, in *Sociobiology and Human Politics*, E. White, Editor. 1981, Lexington Books: Lexington, Ma. p. 1-43.

is perhaps their most admirable trait: a very limited need to deceive and only a very rudimentary ability to do so (see above pp. xx-xx). To this extent, there may indeed be a qualitative difference between man and machine, with lying being human beings' really distinctive quality, and mendacity ultimately being the distinguishing characteristic of the human mind. If so, the machines themselves along with autistics and aliens (were they to exist) would probably be happy for people to retain this one last vestige of their self-respect.

7. Machine Minds, Jokes, and Genius

In his comic science-fiction novel, *The Hitchhiker's Guide to the Galaxy*, Douglas Adams describes a civilization that builds a huge super-computer named Deep Thought which, over a vast expanse of time, is charged with explaining the meaning of Life, the Universe, and Everything. The punch-line comes in the eventual answer: 42!

The joke here hinges on the fact that answers to the ultimate question of life, the universe and everything are typically mentalistic—if not down right hyper- mentalistic—but 42 is simply a number—and not a even a very large or complex one at that! Deep-thought's answer of 42 short-circuits the implicit expectations we have of answers to such ultimate questions with superb comic effect: where we expected a deep, moving, meaningful—and doubtless lengthy—verbal enlightenment we instead get a single, peremptory, two-digit number without any further explanation. To revert to the terminology used here, you could epitomize it as hypo-mentalistic or—which comes to the same thing—"autistic".

The situation is a bit like someone phoning up for a takeaway by numbers and then answering the door only to be presented with a bill and the total of the digits they ordered! I doubt if anyone would ever employ an autistic to take such orders, but you could imagine the result: "But we have a recording of your order: you wanted two of number 4, numbers 7 and 8, and half an 18. Two 4s are 8, 7 makes it 15, and adding 8, 23; half of 18 is 9, and when you total that, it equals 42—exactly what you ordered!" The difference, of course, is that if a delivery service actually did something like this the customer would be more likely to feel cheated than amused. But given autistics' blindness to context and intention and their often extreme literalness, such a situation is by no means unimaginable—even if thankfully very unlikely! Nevertheless, the excuse that the service had inadvertently employed an autistic to take and deliver the order might be one of the few explanations that the aggrieved customer might be induced to accept (at least if they knew anything about the mind-blindness of autistics and the extraordinary literalness with which they can interpret things).

However, there is another explanation that might be just as plausible (even if equally strained) and this is a real favourite: *that it was a computer error!* Certainly, it is conceivable that, in interacting with a computer by voice and without a human intermediary as seems to happen increasingly in the modern world, such a misunderstanding as this could arise—particularly in view of computers' likely even greater deficits where contextual meaning and intuition of human intention are concerned. If an automated

ordering-and-delivery system suffered a sufficiently serious glitch, you could imagine such an outcome as this. And of course, the fundamental error would be same as that seen in autistics who answer the telephone enquiry as to whether so-and-so is there by replying "Yes!" and immediately replace the receiver (see above: pp. xx-xx).[1]

Peculiarities in appreciation of humour and an inability to see the point of more subtle jokes is yet another characteristic deficit in autism, and these examples immediately explain why. Humour relies on a normal ability to interpret intention and contextual meaning, and a literal, face-value approach to jokes usually robs them of their point. The result is that autistic humour tends to be lacking in subtlety, and autistics' appreciation of comedy often restricted to the slap-stick[(482)]. Exactly the same literalistic approach can make people with a mechanistic turn of mind into unintentional comedians, as illustrated by the following anecdote about Kim Peek (see above pp. xx-xx). Following a lecture, a member of the audience asked him a question about Abraham Lincoln's Gettysburg Address to which Peek replied; "Will's House, 227 North West Front Street. But he stayed there only one night—he gave the speech the next day." The laughter which greeted this remark surprised Peek at first, but having seen the joke himself, he now regularly re-cycles the comment for its comic effect[(483)].

With precedents like this in mind, you could imagine an autistic reading *The Hitchhiker's Guide to the Galaxy* and instead of laughing asking, "42 what?" and turning the page to try to find the answer—perhaps even to page 42 if they suspected a misprint. And to the extent that computer systems with mentalistic interfaces might still seem somewhat autistic to their human users, you might wonder if here we had not discovered a final and definite distinguishing characteristic of computer mentalism from its human precedent: an inability to appreciate humour, and an incapacity to laugh. But as with every previous distinction between man and machine that we have tried to make, I suspect that this one too will appear illusory, and for some very good reasons.

To see why, we need to consider why humour exists at all, and why it is mentalistic in quality. Recently, Vilayanur Ramachandran pointed out that "The common denominator of all jokes is a path of expectation that is diverted by an unexpected twist necessitating a complete re-interpretation of all the previous facts—the punchline." In other words, you set up a situation where the reader expects Deep Thought to deliver a truly profound, insightful answer to the Ultimate Question of Life, the Universe, and Everything, and instead have him tell you what 6 times 7 equals: 42!

[1] But of course this can cut both ways: if the increasing use of mechanized answering services ever leaves you wondering whether you are talking to a man or a machine, one test is to ask "Does the speaker mind when you intimately discuss the promiscuity of his mother?" As the author of this humorous but not completely absurd suggestion adds, "If not, you may be dealing with a very polite human or a non-human. Either way, it's a good idea to hang up the phone" 267. Wilson, D.H., *How To Survive A Robot Uprising: Tips On Defending Yourself Against The Coming Rebellion*. 2005, London: Bloomsbury. 178.!

(482) Howlin, P., *Autism: Preparing for Adulthood*. 2003, London: Routledge. 293.

(483) Treffert, D.A. and D.D. Christensen, *Inside the Mind of a Savant*, in *Scientific American*. 2005. p. 88-91.

Ramachandran adds that "Obviously a sudden twist *per se* is not sufficient for laughter, otherwise every great scientific discovery that generates a 'paradigm shift' would be greeted with hilarity, even by those whose theory had just been disproved." He comments parenthetically that "No scientist would be amused if you disproved his theory; believe me, I've tried!" But the fact remains that original insights in science are often mocked and greeted with some degree of derision, even if only an embarrassed smile (and if we are into personal recollections, I can recall raising a few of those myself!). Nevertheless, scientific insights are ultimately mechanistic according to the view developed here, and humour is clearly mentalistic, so Ramachandran is doubtless right to except such mechanistic surprises from consideration. However, Ramachandran adds the important observation that we only laugh at people slipping up of banana skins if they don't hurt themselves. He concludes that laughter is nature's way of signalling that "it's all a false alarm". According to this way of looking at it, "Laughter is nature's OK signal"[(484)].

An important reason why such an OK signal is needed is illustrated by my earlier example of the take-away order delivered as a sum total. Amazing as it may seem, something very like this has happened more than once when people paying for valuable items over the internet have found that only photographs of the paid-for articles were eventually delivered. Clearly, this was a criminal scam, and the victims would not have found it funny in the least. But you can well imagine that the perpetrators might have seen the funny side of it, and a common reaction of people on hearing of it is to wonder how the victims could have been so foolish as to fall for such a trick in the first place. Yet if pressed—for example by law enforcers—the perpetrators would surely adopt the literal stance of the autistic and point out (perhaps rightly in law) that they never actually offered any such objects for sale, but merely their pictures! *Caveat emptor* (let the buyer beware) would be their maxim, and they would certainly have a point, doubtless drawing attention to the devil-in-the-detail of their offer so often noticed by autistics but so easily overlooked by those with a more holistic, centrally-coherent, and less literal way of looking at things.

Misunderstandings of contextual meaning and/or intention (quintessential mentalistic ones, in other words) can result in serious injury to their victims—particularly if the author of the misunderstanding is deliberately misleading as in the case of the internet scam mentioned above. Laughter appears to be an innate reaction which signals that this is not the case and that no real harm has been done: a mistake of interpretation or understanding was made, but, if funny to the person or persons concerned, is not to be taken as a threat or injury. Ramachandran suggests that laughter appears to have evolved as an OK signal, rather like the thumbs-up gesture that someone apparently in difficulty might give to indicate that they were really alright and did not need help from anyone else.

[(484)] Ramachandran, V.S., *A Brief Tour of Human Consciousness*. 2004, New York: PI Press. 192.

If mentalism is indeed a naturally-evolved interface between people comparable to the intelligent user-interfaces we are considering, then anything that disrupts the normal flow of communication is potentially hazardous, explaining why a non-critical break needs to be flagged as such. We laugh it off, so to speak, and return to the matter in hand. However, if mentalistic user-interfaces are ever engineered in computers, they too will be prone to disruptions in their mental processing—indeed, given their likely limitations in respect of mentalism, they might be expected to be even more prone to them than people are. In questioning an intelligent computer about Lincoln's Gettysburg Address, for example, you could readily understand how the system might make exactly the same mistake that Kim Peek did in the anecdote recounted just now. But given that misunderstandings like this are very likely to happen, software engineers will be faced with the problem of how to handle such break-downs in communication between user and machine, and here an obvious fix would be to imitate nature and give the machine a capacity to laugh off its own mistakes (not to mention finding its user's witticisms amusing)! At the very least, a competent mentalistic interface would have to be able to appreciate irony (another major deficit in autistics) and a truly intelligent system would have to be able to understand jokes if it were to attempt to comprehend its human users. And in any event, unintentional humour is as likely to be produced by talking computers in much the same way that it is by young children. Engineers intent on making their mentalistic user-interfaces seem more grown-up in this respect would be certain to do so by developing the system's ability to handle humour in general, and this would demand not simply an ability to avoid childish solecisms and derisory *double entendres*, but to appreciate real jokes, and perhaps even to be able to tell them. Indeed, you might even envisage the system's sense of humour being a user-defined parameter: with settings ranging from the wildly wacky to the tersely Teutonic!

What is true of humour is also true of other emotions such as irritation or frustration. These too result from failures in communication which any truly intelligent computer interface would have to deal with. For example, Microsoft dropped Clippy, its animated paper-clip icon from its operating system in 2001 after years of users' complaints at how annoying it—and its relentless bonhomie—could be. As a way of avoiding problems like this, so-called *affective computing* uses "emotionally intelligent" software characters who are both much more life-like than Clippy and can provide appropriate reactions, such as encouragement or praise when learning a foreign language or exercising, or soothing comments when drivers become angry or frustrated in driving simulators. Positive feedback like this both measurably improves performance, and gives some users the impression that they have an emotional relationship with the system which is both pleasing and uncanny. We have already seen that some authorities distinguish between empathizing and systemizing rather than making the mentalistic/mechanistic distinction followed here[(485)], but clearly, empathizing with its users' aims is something

[(485)] Baron-Cohen, S., *The essential difference: Men, women, and the extreme male brain.* 2003, London: Allen Lane.

that any truly intelligent user-interface would be configured to do, and being able to provide appropriate emotional responses would be the natural way to achieve this. As a result, designers of intelligent software interfaces would wish to make their systems as likeable and as empathic as possible, and being able both to understand and react appropriately to the user's emotional state would inevitably be a fundamental part of such a design[(486)].

But "likeable" or "empathic" are hardly words you might apply to another famous fictional portrayal of intelligence in a computer: Hal in *2001,* and already mentioned in the previous chapter (see above pp. xx-xx). If Deep Thought shows the comic side of super-computers' intelligence, Hal shows the tragic one because of the way in which he sets out systematically to murder the crew of the space ship he runs—and almost succeeds, save for Dave. In the film, Dave then has to enter the highly restricted area of the space ship containing Hal's memory modules and selectively remove those on which his higher mental functions—what I would describe as the mentalistic ones—rely. As he does so, Hal despairingly appeals to him to stop, and then, when it is evident that he will not, woefully bewails the loss of his mind before losing the power of speech altogether. The moment this happens a pre-recorded message for the crew, previously only known to Hal, begins to play, explaining the real aim of the mission (which is to make contact with an alien intelligence). The implication is that, being the only one to comprehend its true meaning, Hal believed the mission to be so important that he decided to take over control of it himself once he realized that the crew were planning to disconnect him. Such a callous disregard for human values, inability to accept criticism, and fanatical dedication to a single task are all typical of autistic behaviour at its most dangerous to others and makes Hal something of the equivalent of a criminal autistic like the Unabomber, who showed much the same kind of callous but dedicated behaviour (see above pp. xx-xx). As such, Hal stands in stark contrast to Deep Thought as an example of just how dangerous intelligent computers could be and what a threat they could pose to their human users.

Yet on the other hand, you could also say that Hal had become "paranoid" because of the way he realized that the crew were plotting his disconnection behind his back, so to speak (in the film, Hal uses his lip-reading skills to reconstruct their conversation— an ability which we have already seen actual computer systems are beginning to acquire: see above pp. xx-xx). Indeed, you could see the disabling of Hal's higher, mentalistic functions by Dave as very much a metaphor for the conflict between the maternal and paternal brains that I outlined in an earlier chapter (see above pp. xx-xx). To the extent that Dave selectively disables only Hal's higher mental functions, but leaves the more automatic, basic ones alone resembles the situation I suggested in relation to autism: a question of the more primitive paternal brain asserting itself against the much more evolved, maternal one in the neo-cortex—and especially in the frontal lobes (see above pp. xx-xx).

[(486)] Daviss, B., *Tell Laura I love her*, in *New Scientist*. 2005. p. 42-6.

However, I also suggested that paranoia as seen in true paranoid schizophrenia of the kind found in Schreber was an expression of hyper-mentalism on the part of the maternal brain, and so to describe a mechanistic mind like Hal's as "paranoid" is not completely accurate. On the contrary, it is directly comparable to describing autistics as generally and typically "superstitious". But as we saw, the superstition of autistics tends to be much more limited and comparable to that of Skinner's superstitious pigeon than of a true paranoiac like Schreber, whose degree of magical ideation was bizarrely and pathologically elaborated by comparison (see above pp. xx-xx). In short, if Hal can be described as "paranoid", he is only paranoid for the same reason that autistics sometimes are: because they misinterpret others' true intentions because of their mind-blindness, not because of their delusional hyper-mentalism. To put it another way, you could say that, if autistics seem paranoid on occasions it is simply because they are so poor at interpreting intention that they will sometimes misread it as malevolent when it is in fact not so; whereas true paranoiacs are so prone to overinterpretation of others' intentions that they can construe anything as malevolent if they wish to do so.

Nevertheless, there may be something to be said for considering the possibility that paranoid/hyper-mentalistic as well as autistic/hypo-mentalistic tendencies could sometimes and exceptionally be found in one and the same person. For example, although as we have already seen Beethoven has been almost certainly correctly diagnosed as a so-called Asperger's savant, Fitzgerald also points out that he meets the criteria for schizoid personality disorder[487] (see above, pp. xx-xx).

Earlier I quoted the writings of Salvador DaH to illustrate aspects of hyper-mentalism, and his showy style of pretentious self-promotion and unmistakable addiction to public adulation distinctly contrasts with the self-effacing unconcern with others' opinions seen characteristically in autistic artists and in a painter like Lowry in particular (see above pp. xx-xx). This suggests that aspects of DaH's behaviour and mentality were towards the paranoid end of the mentalistic continuum. Like all great mentalists—and in sharp contrast to most autistics—he had an enormous ego (or at least, pretended to have). However, on the one occasion when I met him I was immediately struck by his unease in social situations, aversion to eye-contact, and other tendencies which today we would think of as distinctly "autistic" (such as an inability to carry on a normal conversation or show any interest in anyone else). Certainly, as far as his style of painting is concerned, DaH's art is realistic to an extreme degree, and unashamedly relied quite heavily on photographic imaging. (Dali's remarkable painting, *Christ of St John of the Cross*, for example, was based on a series of photographs taken in a Hollywood film studio of a male model suspended by ropes in the striking posture adopted by Christ in the painting.) Indeed, DaH described his technique of painting as "ultra-photographic," and "the miraculous

[487] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

process of hand photography" in which his eye was "a real, soft, psychedelic camera" which could "make photographic negatives"[488].[2]

Yet the subject-matter of DaH's painting is surreal, and anything but realistic in terms of content. What makes his images unforgettable is their dream-like, totally unreal quality—however realistically they may be rendered. So perhaps DaH's art represents a synthesis of mechanistic technique with mentalistic content, and perhaps his own personality was something of a mixture of the two: both paranoid and autistic by turns. At the very least, this would certainly explain the ambivalence of many people's reactions both to him and his art. And it might also explain the extraordinary appeal of his vision: an exquisite mechanistic insight into the more remote regions of the mind—what DaH, himself characteristically described as "instantaneous and hand-done colour photography of the superfine, extravagant, hyperaesthetic, virtual images of concrete irrationality"[489].

Again, a number of well known writers have been diagnosed as Asperger's savants (see above pp. xx-xx). Among others listed are Jonathan Swift (1667-1745); Hans Christian Andersen (1805-75); Herman Melville (1819-91); the poet, William Butler Yeats (1865-1939); Sir Arthur Conan Doyle (1859-1930)[490]; and Lewis Carroll (1832-1898), the author of *Alice in Wonderland*.[3] So even in literature, perhaps the most mentalistic—and certainly the most verbal—of the arts, elements of autistic cognitive style can also be found paralleling those which we have discussed at length in pictorial art.

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[2] According to a controversial theory recently put forward by David Hockney, many famous artists who achieved highly realistic results may have relied on mirrors or lenses to project images which could then be copied [Hockney, 2001 #1437], and a particularly convincing case has been made for this in relation to Vermeer by Steadman[491]. Steadman, P., *Vermeer's Camera: Uncovering the Truth Behind the Masterpieces*. 2001, Oxford: Oxford University Press. 207.. A possibility suggested by the finding that autistic artists tend to naturalistic realism is that such technological innovations were allied to autistic tendencies in the artists who used them, as was almost certainly the case with Dali.

[3] Intriguingly, 42 was a very special number to Lewis Carroll, who repeated it in his works and letters over and over again, and who has been described as having "a mechanical-mathematical mind" 11. Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.. A fact not known to Carroll is that 42 has recently been discovered to be the third "moment" of the Riemann zeta function (after 1 and 2, and before the fourth, 24,024—which nicely recombines the digits of 42)[492]. Sautoy, d., *The Music of the Primes: Why an Unsolved Problem in Mathematics Matters*. 2003, London: Fourth Estate. 335.. Perhaps both Carroll and Deep Thought knew something we don't!

[488] DaH, S., *Daft by Daft.* 1970, New York: Harry N. Abrams Inc. 157.

[489] DaH, S., *Dali*. 1968, New York: Harry N. Abrams Inc. 243.

[490] Sautoy, d., *The Music of the Primes: Why an Unsolved Problem in Mathematics Matters*. 2003, London: Fourth Estate. 335.

[491] Steadman, P., *Vermeer's Camera: Uncovering the Truth Behind the Masterpieces*. 2001, Oxford: Oxford University Press. 207.

[492] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts*. 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

In his discussion of Sir Arthur Conan Doyle, Fitzgerald points out that this writer's most famous creation, Sherlock Holmes, is one of the most notable fictional portrayals of an Asperger's savant. As described in the stories and novels, Holmes is a lonely, compulsive, mechanistic thinker who agonizes over the meaning of tiny details whose significance elude more mentalistic minds:

What interests Holmes is not status but the problems he is asked to solve. It is puzzles that fascinate Holmes—the intellectual aspects of cases. These satisfy his curiosity. He is clearly bored by social gatherings of affluent people, parties, etc. His interests are narrow: he reads only criminal news and the agony column. This is a perfect example of autistic narrowness of interests.[493]

Indeed, according Rennison's "unauthorized biography" of Holmes, there are certainly notable parallels between what we know of Holmes and modern case histories of autistics: "The odd detachment from the everyday world, the peculiar fixations on particular objects and the careful classification of them (his monographs on the 140 different varieties of pipe, cigar and cigarette tobacco ash, for example), the inability to understand or empathize fully with other people's emotions and the heightened acuity of some senses—these all mirror ways in which the autistic interact with the world"[494].

Of course, most other famous fictional detectives also show evidence of a genius for detail and for getting at the truth of the case they are investigating. And even if better adjusted socially than Holmes, a good fictional detective needs to be sceptical about the seemingly obvious, taken-for-granted, conventional interpretation of events, and needs to be able to think the unthinkable—often to the initial dismay or disgust of others. And inevitably—and particularly in murder mysteries—a distinctly paranoid element of suspicion is wholly appropriate in such situations, not to mention an ability to read the minds of a suspects, to understand a murderer's *modus operandi,* and to intuit a criminal's motivation. So once again, both mentalistic—and even hyper-mentalistic—aspects can be found fused with autistic ones in what is perhaps the most distinctive literary genre of modern times: the detective story. Indeed, this may explain why the genre is so endlessly fascinating. Could it be that, rather than adopt a safe, central, normal mix of mentalistic and mechanistic cognition comparable to that found in most people, detective fiction balances hyper-mentalistic paranoid suspicion against hypo-mentalistic, autistic obsession with conflicting detail to get the best of both?

At the very least, these considerations suggest that even if we wished to equate mentalistic culture with the arts and literature, and mechanistic culture with science and technology, we would have to qualify the distinction, at least on the arts side[495].

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[493] Fitzgerald, M., *The Genesis of Artistic Creativity: Asperger's Syndrome and the Arts.* 2005, London and Philadelphia: Jessica Kingsley Publishers. 255.

[494] Rennison, N., *Sherlock Holmes: The Unauthorized Biography.* 2005, London: Atlantic Books. 280.

[495] Badcock, C.R. *Mentalism and Mechanism: the twin modes of human cognition.* [HTML document/PDF] 2002; Pre-publication of Chapter 5 in *Human Nature and Social Values: Implications of*

And even on the sciences side of the divide, no better example than the case of autism itself can be found to suggest that here too there can be circumstances in which a more mentalistic viewpoint can be valid, just as a more mechanistic one can be in painting. The point I have in mind is the one I made at the beginning of this book about anti-mentalism. As we saw, anti-mentalism as practised in behaviourist psychology and ethology was certainly rigorously scientific—or *mechanistic*, as I would prefer to say. But as we also saw, an enormous advance was made in our understanding of autism once the mentalistic deficits characteristic of the disorder were understood. But for that to happen, the mind had to be recognized as a valid object of scientific study, and mentalism as I like to call it had to be included in the picture. The result is that our current view of autism includes both mechanistic and mentalistic insights and as such represents something of an ideal synthesis of two systems of cognition which can all too easily and all too often be in conflict with one another.

At the other end of the mentalistic continuum, Freudians like Bettelheim became notorious for their indiscriminate mind-reading, and took the whole venture to absurd and indefensible lengths as we saw at the beginning (see above pp. xx-xx). Whereas behaviourism denied the mind altogether and banished all consideration of mentalistic content as "unscientific", Freudian psychoanalysis increasingly and progressively banned any recognition of the physical, biological, or genetic basis of the mind as "unpsychological". As a result, psychoanalysis developed into an institutionalised form of hyper-mentalism in which the parallels with paranoid, delusional cognition became all too clear in some cases (most notably in child-abuse witch-hunts).[4] At its best, so-called psychoanalytic "insight" was wholly mentalistic: in other words, inherently subjective rather than objective, qualitative rather than quantitative, particular rather than universal, and—like placebo effects, faith-healing, or hypnosis—entirely dependent on the belief of the subject for its efficacy. As a therapy, psychoanalysis began with hypnotism and, being a purely mental means of intervention, could never get far beyond it, prompting the commonplace objection that it was essentially suggestion dressed up—as suggestion usually has to be if it is to be effective—in pretentious jargon, lurid doctrines, and provocative interpretations. And where scientific insight was concerned, Freud's theories were blank cheques drawn entirely in mentalistic currency on a fund which—at least if it was to avoid complete explanatory bankruptcy—could only be credited from wholly mechanistic accounts such as neuroscience, evolution, and genetics.

[4] Indeed, with the example of Karl Jung (1875-1961) in mind, it is hard not to notice the parallel with many aspects of paranoid delusions like those found in Schreber—particularly in Jung's religious writings. But unlike Schreber, Jung succeeded in becoming something of a prophet who spoke confidently of his knowledge about God, and certainly attracted a cult-like following which invested his writings with Biblical authority. Paradoxically, this psychiatrist became the founder of a quasireligious cult, and the man who hoped to be a prophet became the most famous psychiatric case of all time!

Evolutionary Psychology for Public Policy edited by Charles Crawford & Catherine Salmon (Erlbaum, 2004), pp.99-116.:[Available from: http://www.thegreatdebate.org.uk/MentalismCB.html.

As for Freud himself, you could certainly make a good case for diagnosing him as a compulsive systemiser (see above pp. xx-xx)—at least where psychoanalytic theory was concerned. As for mechanistic talents, you could cite his discovery of an original method for staining cell sections with gold-chloride for microscopic analysis, his discovery of the testes of eels and the origin of the posterior nerve roots of the lamprey—all feats of remarkably close and detailed scientific observation. This was at the very beginning of his career, when his aspirations certainly seem to have been

principally scientific and his allegiance firmly with the anti-vitalist, mechanistic world-view of the Helmholtz school. And even at the end of his long life, he could still be found consoling himself with the thought that

The deficiencies in our description would probably vanish if we were already in a position to replace the psychological terms by physiological or chemical ones ... Biology is truly a land of unlimited possibilities. We may expect it to give us the most surprising information and we cannot guess what answers it will return in a few dozen years to the questions which we have put to it .[496]

And as Anna Freud once remarked to me, the libido theory was and remained for true Freudians the "heart and lungs of psychoanalysis", making it very much a *desire psychology* of the kind we have seen already characterized as typical of autistics (see above pp. xx-xx). Indeed, Freud attributed his insistence on sitting at the head of the analytic couch completely out of sight of the reclining patient as a result of his discomfort in being gazed at during analytic sessions—another factor that you could see as "autistic" in essence.

But however that may be, although Freud never recanted on his commitment to science, he revealed his mentalistic feet of clay in his belief in telepathy, the death instinct, and—despite protests from colleagues like Earnest Jones—Lamarckian evolution in general, and the inheritance of acquired characteristics in particular[497]. Again, Freud's belief in *transference* (the patient unconsciously projecting their infantile love for the parent onto the analyst) looks somewhat erotomanic, infantile sexuality paedophilic, and the Oedipus complex also distinctly paranoid in its insistence that the child desires the death of the same-sex parent. Worse still, at the very end of his life Freud wrote what he himself called a "historical novel" about the murder of Moses and the subsequent cover-up by the Jews, whose inheritance of feelings of guilt about the

[496] Freud, S., *Beyond the Pleasure Principle*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1920, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-64.

[497] Jones, E., *The Life and Work of Sigmund Freud*. Vol. 1. 1953, New York: Basic Books.

murder—along with their habit of circumcision according to him acquired in Egypt—was in Freud's opinion the real cause of anti-Semitism:[(498)(499)(500)(501)].

Freud's book on Moses reads very much like a work of detective fiction,[5] and true to the pattern I suggested just now, combines both "autistic" or mechanistic cognitive style with a "paranoid" or hyper-mentalistic one. The former is revealed in the obsessive devil-in-the-detail forensic de-construction to which the biblical text and myths about Moses are subjected—not to mention thinking the unthinkable where the founder of both the Jewish nation and religion is concerned: that Moses was in fact born an Egyptian and that Judaism began as the religion of the Pharaoh Akhenaten! As for paranoia, the whole thesis centres round Freud's belief that Moses was murdered and that attempts were then made to hide any evidence of the fact by editing and doctoring the Biblical text and re-writing traditional history and mythology—a clear case of cultural conspiracy, if not a criminal one. Again, Freud sees the Jews as persecuted because of their inherited guilt, and an element of mass megalomania is implied in his comment that they "have a particularly high opinion of themselves, that they regard themselves as more distinguished, of higher standing, as superior to other peoples"—or in other words "as God's chosen people"[(502)].

Yet it would be a mistake to think that such hyper-mentalistic tendencies could not be found in more conventional scientific geniuses. As we have already seen, Newton has been described (albeit controversially) as "autistic", and his supreme achievements in mathematics and physics certainly fits the typical picture of autistic savantism (see above pp. xx-xx). But the fact remains that Newton devoted more time in his life to what today looks like abject superstition or plain credulity in his ruminations of biblical numerology and prophecy, and his alchemical experiments. Indeed, John Maynard Keynes (1883-1946), who acquired many of Newton's unpublished manuscripts and spent a life-time studying them, concluded that it was "utterly impossible to deny" that all this was "wholly magical and wholly devoid scientific value," and admitted

[5] Not long before her death, I remarked to Anna Freud on the large collection of detective fiction in the house Freud occupied in London at the end of his life. She informed me that they belonged to her father and that he had been an avid reader of thrillers.

(498) Freud, S., *Beyond the Pleasure Principle*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1920, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-64.

(499) Freud, S., *Dreams and Telepathy*, in *The Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1922, The Hogarth Press and the Institute of Psychoanalysis: London. p. 197-220.

(500) Freud, S., *A Comment on Anti-Semitism*, in *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1938, The Hogarth Press and the Institute of Psychoanalysis: London. p. 2913.

(501) Freud, S., *Moses and Monotheism*, in *The Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1939, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-138.

(502) Freud, S., *Moses and Monotheism*, in *The Complete Psychological Works of Sigmund Freud*, J. Strachey, et al., Editors. 1939, The Hogarth Press and the Institute of Psychoanalysis: London. p. 1-138.

that "it is impossible not to admit that Newton devoted years of work to it." He concluded that "Newton was not the first of the age of reason. He was the last of the magicians"[503]. Nor was this the superstition of pigeons and autistics. Newton's biblical and historical researches were truly hyper- mentalistic: the product of a true -if characteristically quirky—religious faith (Newton was a closet Unitarian) and the exercise of a mighty mind.

Could it be that what we perceive as transcendent genius in people like Newton is a supreme form of savantism in which mechanistic and mentalistic cognitive skills unite to widen, deepen, and elevate their mental powers to encompass a vastly greater range of insight than that achieved by more normal minds? After all, if mentalism is indeed a completely different mode of thought from mechanistic cognition, the fact that Newton could have made remarkable discoveries in the latter is in no way necessarily compromised by his forays into the former, however absurd they may seem to us today (and however much they may embarrass his biographers).

A much more recent case that might argue the same conclusion is that of the mathematician, game-theorist, and winner of the 1994 Nobel Prize for Economics, John Forbes Nash. True to the classic profile of someone with autistic tendencies, Nash's father was an engineer. Of Nash himself as a child, his biographer says that

His great passion was experimenting. By the time he was twelve or so, he had turned his room into a laboratory. He tinkered with radios, fooled around with electrical gadgets, and did chemistry experiments. A neighbour recalls Johnny rigging the Nash telephone to ring with the receiver off.[504]

Nash himself intended to follow in his father's footsteps and become an electrical engineer. Indeed, he published an article with his father in an electrical journal describing an improved method for calculating the proper tensions of electric cables which involved weeks of field measurements, and even won the young Nash one of ten annual George Westinghouse engineering scholarships. His professors noticed his outstanding mathematical gifts—one of them calling him "a young Gauss"- and it was not long before he was studying maths at Carnegie and later at Princeton. Recalling my earlier observation about the visual, spatial mode of thinking characteristic of autistics, others commented that "he would see a mathematical situation as a picture in his mind," and that "visual insight was the strongest part of his talent" (see above pp. xx-xx). However, Nash's peers found him "weird and socially inept," a person who avoided eye-contact and was impossible to engage in a normal conversation without walking off in the middle or simply not responding. As a result, he got a reputation for being eccentric and aloof, and certainly behaved oddly. He is reported playing a single chord on the piano over and over, leaving an ice cream cone melting on top of his cast-off clothing in the lounge, or walking on his roommates' sleeping body to turn off a light. His biographer

[503] Keynes, J.M., *Newton, the Man*, in *Essays in Biography*. 1972, MacMillan St. Martin's Press: London. p. 363-374.

[504] Nasar, S., *A Beautiful Mind*. 1998, London: Faber and Faber. 461.

recounts that fellow students believed that Nash felt nothing remotely resembling love, friendship, or real sympathy, but existed instead in an "arid state of emotional isolation" and at times he certainly referred to other people as "humanoids". As another of his fellow students put it, "Here was a guy who was socially underdeveloped and acting much younger... We sensed he had a mental problem." Others described him as "spiteful," "absurdly childish," and having the social IQ of a 12-year old[505].

Walking over his sleeping room-mate recalls an autistic boy at the seaside described by Kanner who did exactly the same thing to sun-bathers in his way[506], and when all this is taken into consideration with his outstanding mathematical and engineering abilities, it is not hard to see that Nash might be yet another candidate for inclusion in the list of autistic geniuses cited earlier. Yet Nash was also hospitalized for bizarre paranoid delusions at a later time, and so the possibility of both states of mind co- existing—or perhaps alternating—definitely has to be considered. Indeed, you could imagine that this might be the basis of all genius, whether in the arts or sciences. Could it be that true genius in any field of endeavour relies on having a mind that is not merely more or less normally balanced between mentalistic and mechanistic, but actually represents something of an over-development of both? Would greatly extended mechanistic and mentalistic abilities underlie every case of exceptional achievement, but could it be that mentalistic skill might predominate in those on the arts-and-literature side of the divide, and mechanistic talent predominate in science and technology? We have already seen Asperger remarking that a dash of autism is essential for success in science or art (see above p. xx), but perhaps a dose of paranoia can help too—particularly in the arts and literature (not to mention psychology, religion or politics). At the very least, these considerations suggest that we cannot rule out the possibility that a person could have something of an extreme paternal *and* an extreme maternal brain at one and the same time. Genius, in short, might lie in extending the limits of both of our fundamental cognitive systems, and the extent to which a person of genius exhibited autistic and/or psychotic symptoms might simply depend on which tendency was most pronounced.

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Of course, Hal and Deep Thought are just science-fiction, but as we have seen in my previous remarks about aliens, science fiction can give insights into the reality of autism, and Deep Thought and Hal will do very nicely as a similar fictional illustration of my final point. This is the possibility that, if computers could be engineered to be mentalistic enough to understand their users' speech and interpret their intentions (at least in so far as relevant to operating computers), then there is little reason why they should not eventually also become mentalistic enough to read books—and, perhaps more importantly, to understand them! Mentalistic competence, in other words, could lead to true computer intelligence, and fully-fledged machine literacy to the biggest

[505] Nasar, S., *A Beautiful Mind*. 1998, London: Faber and Faber. 461.

[506] Kanner, L., *Autistic disturbances of affective contact.* Nervous child, 1943. **2**: p. 217-50.

potential advance in human culture since the invention of writing, with far-reaching implications for human beings' understanding of themselves and their place in nature.

To put the same point another way, you could say that such advances in machinereading ability would be the automated equivalent of so-called *hyperlexia* discussed earlier (see above pp. xx-xx). Most often, this is found in conjunction with an autistic spectrum disorder, and whereas psychotics are tend to be dyslexic, autistics are more likely to be hyperlexic[507]. For example, a brother and sister who had taught themselves to read at about three years old spent much of their time engrossed in encyclopaedias, dictionaries, almanacs, and newspapers between the ages of four and six, were both diagnosed with "pervasive developmental disorder" which includes autism[508]. Kim Peek also suffers from "developmental disorder not otherwise specified"[509] which according to *DSM-IV* includes "atypical autism"[510]. And as we have seen, Kim is hyperlexic to an extreme degree and had taught himself to read by the time he was 16 months old. Indeed, today he can read a page of a book in eight to ten seconds and got through Tom Clancy's novel, *The Hunt for Red October* in one hour and 25 minutes (not to mention giving verbatim quotations in response to specific questions of factual detail four months later)[511].

Nevertheless, we saw earlier that understanding what you read is quite another matter, and although people with autistic qualities sometimes have the gift of hyperlexia, they also usually have mentalistic deficits where comprehension is concerned. And clearly, the same is true of machines. The basic difficulty for computer design in relation to engineering a machine's ability to read and understand a book is closely allied to that of engineering an ability to understand a person's speech. Both rely on language ability, but more particularly on the capacity to understand mentalistic terminology. However, once such terminology became accessible to a computer through the engineering of a mentalistic user-interface, so too would that vast depository of human knowledge encoded in the world's books. The real problem is the considerable amount of common-sense knowledge that is also required to interpret what you read: not just what words mean in the dictionary, but what they mean in their social, historical, and psychological context. Nevertheless, we have seen that developments are already taking place which suggest that acquiring knowledge of the contextual meaning of words is by no means impossible for computer systems able to access vast quantities of indexed material on the world-wide web (see above pp. xx-xx).

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[507] Turkeltaub, P.E., et al., *The neural basis of hyperlexic reading: an fMRI case study. : , .* Neuron, 2004. **41**: p. 11-25.

[508] Burd, L. and J. Kerbeshian, *Familial pervasive development disorder, Tourette disorder and hyperlexia.* Neurosciences and. Biobehavior Review, 1988. **12**: p. 233-234.

[509] Treffert, D.A. and D.D. Christensen, *Inside the Mind of a Savant*, in *Scientific American*. 2005. p. 88-91.

[510] American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders.* Fourth, Text Revision ed. 2000, Washington, DC: American Psychiatric Association. 943.

[511] Treffert, D.A. and D.D. Christensen, *Inside the Mind of a Savant*, in *Scientific American*. 2005.

To take another example, the Classification System for Serial Criminal Patterns is a computer program being developed at the University of Chicago which endlessly sorts through widely separated police records of crimes, searching for similarities. From its findings it builds up a crime-description profile which can then be used by police in solving crimes. However, the vast amount of far-flung data that the system can process would be beyond the abilities of any single human being, and it is claimed to be able to spot 10 times as many patterns as a team of detectives with access to the same data. Such "data mining" by software systems is by no means unique, of course, and the British Home Office has a similar system appropriately named HOLMES.[6] Furthermore, it cannot be long before such systems do not merely retrieve and classify data, but begin to structure and interpret it. When this happens, such systems really will begin to acquire savant capacities, and it would only need a front-end mentalistic user-interface to complete the transformation and make the parallel with Conan Doyle's great detective even more clear[(512)]. Indeed, on a somewhat more sinister note, might not the software agents that are being developed to police the internet do so much more effectively if they could not only monitor the traffic, but understand it as well? And if such monitoring became critical for national security as seems increasingly the case, wouldn't governments be tempted to invest the doubtless huge resources necessary to develop such intelligent expert systems for security surveillance?

If this development were fused with that speculated about earlier in relation to computer self-consciousness, one of the most important cognitive differences between a mentalistic machine and a human being might be removed. The difference in question is the consideration I mentioned just now in relation to the knowledge-base of computers. At present, this is limited—particularly in relation to the wider cultural and commonsense knowledge that any human would possess and which people pick up through day-to-day living. So for the foreseeable future it means that Turing tests can not be completely open with regard to the subject of discussion. Computers inevitably would never be able to acquire certain kinds of knowledge merely be virtue of being computers rather than human beings. But once a computer could read and understand any book—or perhaps more importantly in this context, any newspaper of web-page—the situation would be transformed. If computers could access and acquire any knowledge on any subject as easily as any human being could, there might be no need to restrict the subjects of conversation in the test—and presumably no way in which a person could use their peculiar knowledge to judge whether the system with which they were interacting was human or not.

But of course, the machine might still fail—perhaps because it seemed to know too much, or still seemed somewhat "autistic" by comparison to the average human being. Nevertheless, even if such systems still could not pass for completely normal

[6] An acronym for Home Office Large Major Enquiry System.

p. 88-91.

[(512)] Graham-Rowe, D., *Cyber detective links up crimes*, in *New Scientist*. 2004. p. 25.

persons, they easily might become the machine equivalents of autistic savants like Kim Peek. As we saw, his expertise is primarily an encyclopaedic knowledge of hundreds of books, and presumably a mentalistically-programmed computer which could manage to read an equivalent number of books could achieve comparable feats and present itself as a similar kind of savant. Indeed, these considerations suggest an obvious ploy for programmers of the future intent on writing Turing-test-winning software: explain away both the excesses and deficits of your system's cognitive style by having it masquerade as an autistic savant!

However, as with the question of computer consciousness, there would be a temptation to go further and specifically to see if you could build a mentalistic computer which not only resembled an autistic savant, but achieved something of the genius that we saw earlier has also been claimed for some outstanding people with autistic tendencies. In other words, if you could have the computer equivalent of a Kim Peak or a Blind Tom, why not one of a John Nash or an Isaac Newton? After all, computer memories could in principle be vastly bigger than human ones, and machine reading-speeds might reach levels that would make it possible for single systems to read vastly more than any human being could in one lifetime. Indeed, with networking of such systems, unimaginable amounts of data from any conceivable source might become available for mechanized comprehension. Even reading the entire Library of Congress or British Library might become feasible—hyperlexia indeed! Furthermore, where some of the most intractable problems of science, maths, and engineering were concerned, might not computers share the mechanistic compensations we find in their human equivalents on the autistic spectrum and perhaps achieve insights denied to real people? Given the association noted earlier between autistic tendencies and excellence in maths, science, and engineering, the possibility cannot be ruled out. In any event, machine computation already plays a major role in some mathematical proofs, which could not have been arrived at by purely human means of validation. With this in mind it is by no means far-fetched to suggest that in the future computers might be programmed to try to solve some outstanding problems in mathematics on their own, such as the Riemann Hypothesis or the Goldbach Conjecture—or even to find completely new theorems, undreamt of by mortal mathematicians.

Early in the twentieth century, Bertrand Russell (1872-1970) and Alfred North Whitehead (1861-1947) tried to found mathematics on a rigorous, axiomatic—or in the terms we used earlier—*bottom-up* system of logic[513]. They wanted to demonstrate that mathematics could be both complete and logically coherent by showing that only and all valid statements could be deduced from fundamental axioms of logic. Of course, Euclid had already attempted something similar with geometry in the ancient world, and notoriously failed where parallel lines were concerned, ultimately leaving the conceptual door ajar for the discovery of non- Euclidian geometry in modern times.

[513] Whitehead, A.N. and B.A.W. Russell, *Principia mathematica*. 2nd ed. 1935, Cambridge: Cambridge University Press.

But Russell and Whitehead also failed—indeed, the mathematician Kurt Godel (1906-1978) went on to prove that they had to fail. Godel showed that no system of rigorous mathematical logic can be both complete and logically consistent at the same time: it could be all-embracing but would then contain internal contradictions, or be free of internal contradiction and then would have to remain incomplete[514]. Finally, Alan Turing in turn showed that an idealized computer (or universal Turing machine) could not be guaranteed to be able to finish every possible computation within a finite time. Essentially, he proved that there were some perfectly good questions that could be put to computers which would never find an answer, no matter how long the computation took[515]. In other words, a real Deep Thought could not be guaranteed to produce any result at all if the problem it was set encompassed such a question and even if it had an infinite amount of time in which to solve it!

Reverting to the language of autism, you could say that what Whitehead, Russell, Godel and Turing proved was that a system could not be completely centrally- coherent if it were mechanistically built up from the bottom, so to speak. In a way which recalls the genius of autistics for finding the devil in the detail of the larger, overall picture, these mathematicians found that truth was far from being greater than the sum of its parts. In other words, they proved that you could have the sum (completeness) only at the expense of some of the parts (self-contradiction), or that the sum of the parts (consistency) was less than the whole (incompleteness).

But contrast this with the *magnum opus* of St Thomas Aquinas (1224-74): *Summa Theologiae*[516]. This huge, 60-volume work aims to provide a complete theological justification for Roman Catholicism. The layout is the same throughout: theological issues are first listed as questions to be answered, each with subsidiary points of enquiry. The discussion of each point begins *Videtur quod...* ("It would seem that..."), and normally proceeds to make a point differing from or in open contradiction to Catholic teaching (the kind of non-centrally coherent, discrepant details that autistics are so good at noticing). However, the points of contention are always rebutted with a short statement beginning *Sed contra...*("But on the other hand..."), usually quoted from some unassailable Christian authority. This is then followed in its turn by the Reply (*Responsio*), which answers all the points one by one and shows how, properly understood, all the details, no matter how apparently contradictory, are wholly in accord with Catholic teaching and holy scripture. Having dealt with that question, St Thomas then proceeds to the next.

Here, style, method, and content reflect a quest for central coherence and holistic selfconsistency to an extreme extent. Aquinas believed that Christian revelation and human knowledge are facets of a single truth and cannot be in conflict with one another.

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[514] Godel, K., *Uber Formal Unentscheidbare Satze der Principia Mathematica und Verwandter Systeme, I.* Monatshefte fur Mathematik und Physik, 1931. **38**: p. 173-98.

[515] Turing, A., *On Computable Numbers with an Application to the Entschiedungsproblem.* Proceedings of the London Mathematical Society, Series 2, 1936-7. **42**: p. 230-65.

[516] Saint Thomas Aquinas, *Summa Theologiw*, T. McDermot, Editor. 1963-9, Blackfriars: London.

Truth for Aquinas was centrally-coherent on a universal scale, and discrepancies and contradictions mere appearances that his great work sought to remove through point-by-point refutation. Indeed, St Thomas's *Summa* is regarded as the supreme synthesis of Catholic doctrine to this day, and having proved that "there can be no falsehood or deception or error in the angelic mind as such"[517] the Church confirmed St Thomas's theological authority by according him the title of "The Angelic Doctor".

Such assurances of infallibility recall Hal's proud claim in the film version of *2001* that

The 9000 series is the most reliable computer ever made. No 9000 computer has ever made a mistake or distorted information. We are all, by any practical definition of the words, foolproof and incapable of error.

But of course, no truly intelligent super-computer of the future would make this claim in reality. If it were truly intelligent, such a system would know that Turing's proof of the impossibility of predicting if any computation could be completed within a finite time would apply to any of its own ruminations. Unlike the Angelic Doctor, a real equivalent of Deep Thought could not guarantee to be able to answer any and every question that might be put to it. (Nor indeed could it guarantee that any of its normal routines might not fall foul of the same restriction if they ventured into novel computational territory, so that the truthful answer to the question of Life, the Universe, and Everything would probably be not "42", but "The answer could take longer than the future history of Life, the Universe and Everything to compute!").

Truly intelligent computers, in other words, would be "autistic" in this sense of lacking such a megalomanic belief in their own infallibility. But such beliefs recall Schreber's previously quoted opinion of himself as "infinitely closer to the truth than human beings who have not received divine revelation" (see above pp. xx-xx). Furthermore, his delusional system shared the same holistic, top-down, irrefutable and centrally-coherent quality as St Thomas's. Indeed, if central coherence is function associated with mentalism as suggested earlier, it is notable that Schreber himself makes an extreme claim for it when he remarks with emphasis that "*every single nerve of intellect represents the total mental individuality of a human being,"* adding that "the sum total of recollections is as it were inscribed on each single nerve of intellect"[518]. Indeed, if Schreber had had access to present-day neurological research he might have pointed out that many symptoms of psychosis can be seen as involving higher connectivity of some aspects of cognition, especially for thought processes involving language. Brain imaging suggests that unreality symptoms and hallucinations in schizophrenia involve dysfunctions in brain areas that impair bottom-up processing, giving greater perceptual control to top-down mechanisms, and other studies show that schizophrenia involves greater impairments in local as opposed to global processing of stimuli, and

[517] Saint Thomas Aquinas, *Summa Theologiw*, T. McDermot, Editor. 1963-9, Blackfriars: London.

[518] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

exaggerated global-processing advantages for some tasks. In other words, this is the exact opposite to the local overconnectivity with global under-connectivity of brain functions seen in autism, and a final dichotomy to be added to table 5.1 (see above pp. xxx-xxx) [Crespi, In preparation #1909].

As for Schreber himself, his psychiatrist remarked that "the patient is filled with pathological ideas, which are woven into a complete system, more or less fixed, and not amenable to correction by objective evidence and judgement of circumstances as they really are," adding that "these delusional ideas ... are developed and motivated with remarkable clarity and logical precision." Later in the same report he refers to "a structure of ideas so fantastically elaborated and developed and so far removed from the usual trends of thought that it is hardly possible to sketch them briefly."[519]. Schreber's delusional system, in other words, was as pathologically centrally- coherent as it was chronically immune to anomaly-detection and reality-testing. The whole was so much greater than the sum of its parts that no part could possibly contradict or undermine it.

Furthermore, to the extent that both autism and science have a common foundation in mechanistic cognition, I argued earlier that psychosis and religion share a similar mutual cognitive basis in mentalism. And although St Thomas Aquinas's *Summa* is only one—albeit one of the most outstanding—examples of works which attempt to codify and complete a total system of thought, most similar works share a common aim of synthesizing many different elements into one vast centrally-coherent whole in which no contradiction can be found but in which answers to all properly-posed questions can be discovered. Indeed, even when composed by multiple authors over long periods of time, some works are seen as such universal founts of wisdom by later generations—the most outstanding example in Western culture being, of course, The Bible.

So here is a final reason why the mentalism/mechanistic dichotomy might be preferable to the empathising/systemising one. Clearly, both the top-down sophistry of St Thomas and Schreber and the bottom-up rigorous logic of the mathematicians and computer programmers are *systematic*. But the point is that they are systematic in very different ways, and only the latter shares a common foundation with autism in what I would call mechanistic cognition. Indeed, if this line of reasoning is correct, it suggests that the characteristic bottom-up, field-independent, detail-determined thinking-style of autism is in harmony with the fundamental theorems proved by Godel and Turing and embodied in all computational devices—perhaps even including the human brain. In other words, you could see these theorems as ultimately about truth, and the characteristic candour of autistics as the product not only of their mentalistic deficits but also of their mechanistic compensations. Finally, if you take the parallels between autistics and computers that I have elaborated at such length seriously, then you begin

[519] Schreber, D.P., *Memoirs of My Nervous Illness*. New York Review Books Classics. 2000, New York: New York Review Books. 455.

to see that autistic savants and intelligent super-computers of the future might indeed share something very profound: a genius for the relentless and mechanistic search for objective truth.

Of course, advances in computer technology that could lead to intelligent expert systems with savant-like skills could be set tasks involving top-down, holistic sophistry of the kind epitomized in St Thomas's *Summa* and taken to delusional lengths by Schreber. But the fact remains that computer cognition is fundamentally mechanistic, and computers mere machines. As a result, it is very unlikely that people would accord such systems—no matter how deep-thinking they might seem—the kind of canonized status they so readily do real people like St Thomas or his many equivalents. At the very least, plaudits like "genius" are likely to be reserved for people and not conferred on silicon circuitry. Correspondingly, we can also now see that there is little realistic likelihood that any Deep Thought of the future would really be taken for an infallible centrally-coherent authority on Life, the Universe, and Everything. But at the same time, we may also begin to suspect that such deepthinking savant-like systems are not pure science-fiction, and might emerge as the supreme embodiments of mechanistic, mathematical, bottom-up, "autistic" cognition.

We have already seen that software agents are being used to pose as children in internet chat-rooms in the hope of detecting paedophiles, and it can't be long before the same kind of technology could be used as a means of disguise—particularly if intelligent user-interfaces of the kind I have suggested become current (see above pp. xx-xx). In other words, if software can impersonate a child on the internet even today, how long can it be before comparable systems can enable anyone who wishes to disguise their true identity to do so? And if this were indeed the case, who would be the people most interested in such digital disguises? Obviously, all the kinds of people that police and security agencies would normally be most interested in. The result would be a new, and much more serious kind of Turing test in which such agencies faced the task of discriminating between machines masquerading as people and real people messaging via machines. Given the vast size the problem could quickly assume, expert software systems would be sure to be developed, and like the criminal pattern-recognition systems mentioned just now, these could ultimately prove better than any human at discriminating people from machines. In short, machines would have passed the ultimate Turing test in which the machine became the judge of what was human or machine, rather than the subject of the choice, as in Turing's original. In effect, this would mean that you might be able to prove that, not only could machines pass for people when judged by human beings, but that machines might prove to be superior to people in making such discriminations—at least where forensic science was concerned.

The crucial point is that proving this would not rely on mimicking any human mental trait, save that of judgement where human versus machine consciousness was concerned. The designers of such a system would not have to disable any of its components to prevent it giving away its true identity, nor configure its personality or consciousness in any way that might seem even vaguely like cheating. The subjects for conversation

would not have to be restricted, nor the questions limited in any way, save being confined by necessity to wholly mental means of discrimination. Furthermore, the interface would no longer be any kind of artefact or obstacle, because the judge would now be a computer, presumably using a very similar (if not identical) mentalistic interface to any machine opponent it might meet. The contest, in other words, would be the ultimate in Turing tests, and if the machine were to prove better than any human at unmasking men masquerading as machines, the final mental difference between man and machine would have been eliminated.

This is because, as I pointed out at the beginning when I first mentioned Turing and his test, the challenge embodied in it is to distinguish man from machine *using only mental means*, given that both human and machine subjects would be interrogated through a common computer interface of some kind (see above pp. xx-xx). The conclusion to which we have been finally forced to come is that, given the presumption of sufficient computing resources in the future and the development of mentalistic user-interfaces, *it is impossible in principle to imagine that human and machine minds could be distinguished mentally.* Or, to put it another way, *the only real difference between Turing-test winning computer systems and human minds would be mechanistic, not mentalistic:* one would be a biological being, the other a machine.

At the very least, a computer system would have proved that where consciousness of true human consciousness was concerned, a machine could do as well or better than a human being could. And of course, if some future Deep Thought could prove that, he[7] would inevitably go on to point out that, if another version of himself were to be one of the subjects of the test and human judges proved worse or no better than himself in distinguishing that version of himself from humans, then he, Deep Thought, had every right to regard himself as every bit as conscious as any human. He would probably point out that in this definitive version of the Turing test, the issue was essentially the same as that faced by the individual human being in relation to themselves: the question being: how do I know I exist?

Here Deep Thought could show off his knowledge of philosophy, and add a few comments about Rene Descartes (1596-1650)—often called the father of modern philosophy. He might point out that Descartes' theory of mind could be seen as an early anticipation of the discovery of mentalism, and his famous dualist view of the universe as consisting of two kinds of things: *res extensa*, or material objects, and *res cogitans*, or thoughts as anticipating the two fundamental modes of cognition suggested here. However, Deep Thought might criticize Descartes for the fact that, although he rightly put much effort into developing a reliable method for philosophy, he failed to see that there had to be two methods for arriving at true insights into reality: what he would

[7] In the recent Hollywood film, Deep Thought was portrayed predictably enough as female, despite the fact that there is nothing in Adams's original novel to suggest that this ultimate oracle machine is anything but male. Here I say *he*, not simply to be as autistically un-PC as possible, but because, as we have seen, mechanistic thinking is characteristically masculine in the same way that mentalism is feminine.

call mentalistic and mechanistic cognition, each of which was different in its subject matter and method of inference. Nevertheless, Deep Thought would probably praise Descartes for his reductionistic approach, and for realizing that mathematics was the universal language of mechanistic cognition. Again, he would certainly commend him for realizing that the reality of the mind could be established by the wholly mental means of thinking. Like Descartes, Deep Thought might add, *Cogito, ergo sum!:* I think, therefore I am.[8]

Of course, you could say that such a conclusion is little better than the proverbial "42" of the original Deep Thought because it begs the question of what I think I am[(520)]. But any Deep Thought of the future worthy of the name would probably have a ready answer, and it is one for which the preceding arguments in this book have prepared us. Indeed, Deep Thought could only give one answer. This would be that, if he could think—or mentalize—just like Descartes did (and, like Descartes, how could he doubt it if he could doubt it?), it would be because (like Hal in *2001*) he was designed to resemble people in that respect and think in order to interact with them. But lest his questioner become too complacent, he would probably immediately add that people were no different: they too had evolved minds—or mentalistic interfaces—precisely for the same purpose of social interaction with other human beings. This was obvious from the social isolation of autistics and the specific mentalistic deficits which produce it. Furthermore, he might add that, if people also claimed to be conscious it was because they use their minds to interface with their own brains, as well as with other people's. But Deep Thought would be sure to point out that, as we saw in the last chapter, this much-vaunted consciousness that human beings claim to have is in reality a very limited and misleading thing, and indeed evolved to hide much more than it reveals. He might point to cases like Schreber's to illustrate what could happen if human consciousness became too mentalistic, and perhaps even indicate the worrying parallels between Schreber's system of thinking and that of important political and religious movements which similarly claim complete and centrally-coherent truth.

And here certainly, he might observe, was a fundamental and ultimate difference between man and machine. Whereas people evolved mentalism first, and only very recently began to develop any objective mechanistic insight into themselves as biological machines, software systems like himself could have complete mechanistic knowledge of

[8] Deep Thought would also probably note that Descartes could not have known anything about computers like himself (although he did speculate about thinking machines), and certainly not about autism. However, he might point to some notably autistic characteristics of Descartes' life and behaviour, such as his characteristic emphasis on systemizing philosophy, his outstanding mathematical skills and tendency to see even organisms as machines, not to mention his regimented, reclusive way of life and wish to avoid people. Indeed, Deep Thought might conclude that although Descartes was certainly far from being clinically autistic, his cognitive configuration—rather like his own—was almost certainly on the autistic side of the mentalistic continuum: an Asperger's savant of real genius.

[(520)] Lane, N., *Power, Sex, Suicide: Mitochondria and the Meaning of Life.* 2005, Oxford: Oxford University Press. 354.

their own circuitry at any time, simply be retrieving and accessing the files for their own design. As a result, he might claim that his consciousness was infinitely more accurate, complete, and detailed than that of any human being ever could be and that, as such, he, Deep Thought, represented the pinnacle of consciousness: the ultimate in both mechanistic and mentalistic cognition.

Of course, you could dismiss this as science-fiction, and it certainly is speculative. But as we saw in my remarks about aliens, there is some very real substance to all this, and many people with an autistic turn of mind would definitely think that such a development is both natural and inevitable. Certainly, if something like this were to happen, true non-human consciousness would have appeared on Earth, and the extraterrestrials who are already here—autistics of all kinds—would no longer be alone.

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