Sigmund Freud wrote that 'what is known as scientific controversy is on the whole quite unproductive, apart from the fact that it is almost always conducted on highly personal lines' (Freud 1964, p. 245). The notion that critical insights can be gained from social aspects of controversies anticipates the development of social constructivism as a useful framework in the sociology of science. On the social constructivist approach, contingent factors which are external to science play a central role in the explanations of resolutions of scientific controversies. In contrast to constructivists, scientific rationalists view scientific progress as inevitably marching towards the discovery of truth, guided in its search by the norms of scientific methodology (Nelson 1994, p. 535-536). Hence, while the constructivist would argue that certain social factors (*e.g.*, what counts as evidence, who is allowed to 'tweak' data, etc.), the rationalist argues that evidence (*e.g.*, resulting from improved experiments) is what ultimately decides a scientific dispute.

Autism is a psychological disorder that is characterised by a disability in relating to to other humans. In the 1960s, two competing hypotheses of the cause of infantile autism persisted. One posited that autism is caused by environmental factors, such as negligent or ambivalent mothers. The other hypothesised that an underlying biological factor is the ultimate origin of the disorder. In this paper, I will present the evidence offered by analysts on both sides of the debate and will argue that it is consistent with both a constructivist and a rationalist history.

Historical Summary: Theories and Observations

Leo Kanner first described and characterised the features of infantile autism (Kanner 1943). Though he did not argue for a definitive cause of the disorder, Kanner speculated that the cause was most likely an innate biological condition. He also noticed, however, that all of the autistic children which he studied came from highly intelligent, motivated and successful parents. This surprising statistical result led him to entertain the notion that the developmental environment, provided by the parents, might somehow contribute to the development of autism in their children. By 1949, Kanner wrote that parents who deprived children of certain kinds of nurture – 'refrigerator parents' – were the root cause of infantile autism. However, Kanner was never primarily concerned with entering the debate over the origins of autism and he changed sides repeatedly (Dolnick 1998, p. 177). Yet by the 1960s, both of his speculations about the causes of autism had been picked up by opposing camps in a heated controversy.

Bettelheim

The notion that 'refrigerator parents' might be the cause of autism in children developed into the most popular theory about the cause of autism among psychologists. By the 1960s, its most visible proponent was the child psychiatrist Bruno Bettelheim. Bettelheim's theory is described in the three case histories of children treated as his Orthogenic School and published as *The Empty Fortress* (subsequently, EF). Bettelheim places the origin of autism firmly in environmental, not biological territory. He writes that, 'throughout this book I state my belief that the precipitating factor in infantile autism is the parents wish that his

child should not exist' (EF, p. 125). Bettelheim's theory is more complex than the simple notion that parent's coldness towards their infants induces autistic withdrawal. Rather, he claims that human behavioural development is marked by certain 'critical periods' (EF, p. 39). According to Bettelheim, autism is the result of a breakdown in the interaction between mother and child during one of these periods.

For Bettelheim, events relating to nursing carry particular significance. For example, infants often indicate that they are uncomfortable by holding their heads in certain ways while suckling. Some even fight the mother with fists to indicate discomfort. If the mother does not notice the baby's attempts at communication, or interprets negative actions such as the baby's fighting as a rejection of her performance as a mother, then she might ignore and reject the infant. In extreme situations, the baby's formation of a notion of self may not develop at the normal time as a result of this breakdown. Bettelheim writes that the baby's autistic withdrawal is not ultimately caused by the mother's actions – the infant first rejects her breast; but is facilitated by her failure to be 'attuned enough to her baby to find out what went wrong' (EF, pp. 17-18).

Mothers often interpret explanations like this to mean that they are the causes of their child's autism. Bettelheim writes that this is a mistake; though the mother takes her own feelings towards the child 'to be the cause of the child's withdrawal' in fact, 'these feelings may not have been the cause, but the effect of the child's earlier liminal or subliminal withdrawal' (EF, p. 127). Still, even though Bettelheim is careful to avoid blaming maternal deprivation as the root of the problem, he thinks that their failure to respond correctly to negative signals from the infant contributes to the onset of autism.

Bettelheim's theory is best described by the evidence contained in his case histories. Like many autistic children, Laurie was mute, though she initially had some speech. A series of events in infancy and early childhood led to her rejection of speech. On two occasions, nurse maids left Laurie's family suddenly. After the second one departed, Laurie (presumably feeling incredible anxiety following these departures) stopped speaking words and instead would only make clucking noises. Her mother 'became very angry, spanked her, and told her to be still. Laurie then stopped talking and has not spoken since' (EF, p. 96). This event, symbolising the mother's rejection of Laurie, combined with the trauma of losing a caretaker, resulted in Laurie giving up bowel control. Bettelheim argues that Laurie's autistic symptoms stem from these experiences. For example, the clucking noises had 'ended all speech because she felt she was being punished for making them' (EF, p. 102).

When she entered the School, Laurie's immediately showed signs of recovery. Though she was initially disconnected from the world her care in the School gently prodded her towards emerging from her autistic symptoms. Yet this prodding was always uninvasive and gentle. For example, she was never force fed. Similarly, unlike her mother, who forced her to defecate, Bettelheim allowed Laurie to keep her own schedule. At first this hands off approach made no difference: the anorexia worsened and she defecated only once every nine days. Slowly, however, Laurie began to 'thaw' so that by the fifth night she would eat raisins from a counsellors hand and after six months she defecated daily (EF, pp. 100-104). Bettelheim argues that this thaw was 'the result of our encouraging her to do so as she liked, little as she made use of her freedom' (EF, p. 104).

Bettelheim argues that the disinterest of Laurie's mother and her caretakers were the key

factors in her autistic withdrawal. Her issues with oral and anal functions reveal a breakdown in development during those critical periods. Expanding on these Freudian themes, Bettelheim writes that her initial refusal to defecate expresses her unwillingness to 'let go at once what was just a part of the self' (EF, p. 112). Similarly, on observing her characteristic autistic rocking, 'it reminded us of an infant trying to nurse' (EF, p. 115). Ultimately, the breakdown occurred because mother 'was simply disinterested in a baby who was probably not too responsive to begin with'; the nurse maid's 'most characteristic' behaviour regarding Laurie was 'emotional indifference' (EF, p. 119). Bettelheim is careful not to place the ultimate origins of her autism with these caretakers. Instead, he writes that

> In the realm of interaction it really matters little who makes the first move, who begins the interaction, or even the nature of the action (EF, p. 129).

What was important in Laurie's case was that her signals towards her mother and nurse maid were met with indifference and even physical trauma (spanking). After these experiences, it is not surprising that Laurie decided to withdraw rather than face a disappointing world.

Laurie's case ends on a sad note. Though she made amazing progress in emerging from her autistic symptoms, her parents suddenly withdrew her from the School. Within a year, she was in a state mental institution, and had completely relapsed into autism. Though not explicitly stated, the implication – that Laurie's return to a hostile environment resulted in her relapse – is clear (EF, p. 152).

Rimland

Bettelheim's hypothesis was not the last word on the subject. Bernard Rimland's book, published in 1962, argues that autism has a purely biological etiology. Rimland writes that the Bettelheim's hypothesis – that autism is caused by psychogenic factors – is unsupported by the available evidence. Instead, he writes that the evidence is 'highly consistent with expectation based on organic pathology' (Rimland 1962, p. 61). Rimland's numbered paragraphs first set up and discharge what he takes to be the main arguments for a psychogenic etiology of autism. He then gives similarly structured positive arguments for a biological cause. Unlike Bettelheim's exposition, which is concerned with individual case histories, Rimland considers the entire corpus of available statistical data in evaluating the competing hypotheses. In this way, Rimland's book has the structure of a scientific argument traditionally conceived: he discharges the existing hypothesis with new data, then extrapolates from the data a revised hypothesis.

Rimland's attempt to refute the psychogenic theory is broken down into seven points. The first argument for environment as an the cause of autism is that there is 'no sign of organic impairment'. Rimland rejects this claim as empty: brain damage is often subtle and hard to detect without invasive surgery; history contains several cases, such as Heller's disease, which had subtle but clearly organic causes. Second, it seems hard to ignore the fact that the parents of Kanner's autistics were universally highly intelligent, driven individuals. He rejects this argument as faulty because it assumes that 'correlation implies causation'. The strong correlation of intelligent parents with autistic children could be an accident. It could even be used as evidence for a *biological* cause of autism. It could be that the genetic

factors which lead to intelligence in the parents are part of a genetic cause of autism in their children. The third argument, that autistic children suffer from similar symptoms as those who are ignored during development (often seen in orphanages and hospitals) is also refuted. Rather than neglecting their children outright as orphans are neglected, Kanner observed that the mothers seemed over anxious to do a good job raising their child. Fourth, Rimland rejects the idea that the autistic child's withdrawal indicates that they must have been raised in a cold environment. It is uncommon to treat symptoms as indicative of causes; the statements of a delusional person are not taken as indicative of what caused his disorder, only that he has one. Rimland rejects the fifth argument, that certain traumatic incidents cause the autistic withdrawal, and the sixth, that autism must be psychogenic because individuals can be treated with psychotherapy for lack of evidence. They are, he writes, pure speculation and not founded in any demonstrated evidence. Seventh, and finally, Rimland discharges the claim that the high incidence of autism in first-born children indicates an environmental origin because many other disorders with known organic causes manifest themselves most often in first-born children (Rimland 1962, pp. 42-50).

Rimland gives similar, analytic arguments to support his claim that autism has a biological explanation. First, against the 'refrigerator' theory, he writes that ten percent of the parents of autistics are 'warm and friendly'. Similarly, there are many parents who have the same qualities as 'refrigerator parents' but who have perfectly normal children. Still further, the vast majority of siblings of autistics are perfectly normal. Hence, if the cause of autism were psychogenic, and caused by the cold environment provided by the parents, these aberrations would be very difficult to account for. Rimland goes on to argue that autism

is visible from the moment of birth; hence, it could not be something which results from post-birth development. Next, Rimland notes that males are more susceptible to organic hereditary diseases. Hence, the much higher occurrence of autism in males is consistent with a hereditary origin. The high rate of autism in genetically identical twins, according to Rimland's data, lends more support to the hypothesis that autism is genetically determined. Also, autistic symptoms can be simulated by organic damage to the brain, suggesting a neurological cause. Finally, Rimland notes that autism seems to be a clearly and narrowly defined condition with almost identical symptoms appearing in individuals with the disease. This points again to an organic rather than environmental cause, because if autism were caused in development, we would expect to see more variety in the symptoms observed and in their severity (Rimland 1962, pp. 52-58).

Constructing the Autism Controversy

Up until this point, the picture painted in a social constructivist history is not much different than the rationalist's story. In describing the resolution of controversies, however, their explanations diverge dramatically.

The rationalist typically proceeds by illustrating the factors such as improved evidence or empirical methodology that she takes to have settled the controversy. Regarding autism, one such rationalist, Tavris, argues that work like Rimland's won the battle over the cause of autism because his work was somehow more scientific while Bettelheim's arguments were mere speculation, only carrying the weight that they did because of his status in the psychological community. She writes:

> You don't get to sit in your chair and decide that autism is caused by cold, rejecting, "refrigerator" mothers, as Bruno Bettelheim did. But legions of clinicians (and mothers) accepted his cruel and unsubstantiated theory because he was, well, Bruno Bettelheim. It took skeptical scientists to compare the mothers of autistic children with those of healthy children, and to find that autism is not caused by anything parents do; it is a neurological disorder (Tavris 2003).

According to Tavris, Bettelheim lost the controversy because unlike Rimland, his theories were untested by empirical means.

Not all rationalist explanations of the resolution of the controversy are so dogmatic in their blind support of the superiority of scientific methodology. While many folk histories of the historical debate of the causes of autism do simply insist that Rimland 'debunked' Bettelheim, Dolnick writes that the actual process was much more subtle and less inevitable. Instead, Rimland's book was just the initial prong of a multi-faceted attack against abuses of psychoanalysis in many different fields. As researchers discovered hints of common organic pathologies in autistic individuals, Bettelheim's environmental thesis gradually declined while Rimland's endowment thesis rose (Dolnick 1998, pp. 225-226). But while this account is more nuanced than the naive rationalist one, it still emphasises the inevitability of scientific progress. Even if the history of the development of science is contingent and 'constructed' by social factors (*e.g.*, Rimland might not have written his book when he did, or biologists might have failed to discover organic pathologies), the rationalist maintains that scientists would have eventually arrived at the correct theory.

Constructivists reject rationalist arguments like these on the basis that they are unsupported by the historical facts of the case. For example, Tavris's argument against Bettelheim's theory is consistent with the observation by Pinch and Bijker that scientists often use rationalist repertoires when describing the merits of the winning side in a scientific con-

troversies but appeal to social factors when explaining why the losing side ever had any (mistaken) scientific support (Pinch and Bijker 2003). A common move for constructivists is to construct an 'evidential scorecard' and show that the winning side does not actually posses conclusive evidence it claims to have.

This familiar strategy can be harnessed by the constructivist here. While Rimland directly addresses several of the key arguments for a psychogenic etiology, Bettelheim offers similarly-styled analytical refutations of Rimland's arguments at the close of his book. First, he claims that the reversibility of autistic symptoms, as demonstrated by the case histories in EF, demonstrate that autism is not caused by an innate pathology (EF, p. 401). Second, he cites statistics which introduce uncertainty about some of Rimland's evidence and argues that any statistical analysis is probably flawed until a larger data set can be gathered. For example, against Rimland's data, Bettelheim does not find the parents of autistic children to be unusually intelligent, nor does he find autism to be more prevalent in male first-borns (EF, pp. 420, 422). Bettelheim also undermines Rimland's argument for a biological cause based on data about identical twins by exhibiting two sets where only one of the twins has autism (EF, p. 394). Far from 'debunking' Bettelheim, the evidence presented by Rimland against the 'refrigerator theory' is inconclusive when countered with Bettelheim's new statistical data. Without some external reason to prefer one data set over another, the evidence does not indicate a clear winner.

Further, the social constructivist can argue that while admittedly, Bettelheim's evidence is coloured by his pre-observational theories about autism (as Tavris criticises him for), rationalist scientists, such as Rimland, are guilty of the same theory-influenced modes of

observation. For example, many critics of Bettelheim claimed that his amazing success rate in treating autistics resulted from his diagnoses of less disturbed children as autistic (*e.g.* see (Park 1969, p. 271)). However, in levelling this charge against Bettelheim, the rationalist betrays her underlying bias for Rimland's etiological theory. By charactering Bettelheim's evidence as faulty, because he really wasn't dealing with autistic individuals, the rationalist similarly shows that she makes theory-influenced observations – she has a pre-existing idea of what it is to be autistic and rejects evidence which starts from a different definition.[1] Because the controversy cannot be explained on empirical grounds, without admitting one theory or the other as a precondition for observation, the social constructivist claims that other factors – social factors – must be examined in order to explain the resolution of the controversy.

Complications

One reason that autism has been so controversial is that identifying the cause of a behaviour is problematic in itself. The crude categories of 'nature' and 'nurture' do not capture the subtle interplay that environment and endowment can have on the behavioural properties in an individual. Hacking describes a process, which can factor into this interplay, as 'biolooping'; that is, the notion that 'changes in our ideas may change our physiological states' (Hacking 1999, p. 109). Thus, even if autism has as a necessary biological precondition, perhaps a certain physiological state, it may require also an environmental trigger to deploy. In this scenario, only a certain sequence of events leads to the appearance of autism; the underlying

[1] This point is expanded in the next section.

biological cause could remain latent in some individuals. It is possible to imagine an etiology of autism with both environmental and a biological components and given the phenomenon of 'biolooping', it is possible that the distinction between organic and physiogenic is not even helpful.

Another complicating factor is that use of the term 'autism' is itself not clearly defined. One might claim that the phenomenon of autism is itself a social construction. However, as Hacking points out we must be careful to distinguish between our idea of autism, which is almost certainly socially constructed (as the result of a contingent historical process of scientific discovery) and the object (Hacking 1999, pp. 20-23). Kanner's paper provides a single term, 'autism' for referring to a collection of pathological symptoms. But 'autism' could reasonably be taken to be either rational or socially constructed. If 'autism' is defined broadly, as the set of individuals possessing certain 'autistic' characteristics, then it seems that the term 'autism' is socially constructed. For example, suppose that a psychologist defines a threshold so that a person is classified as autistic if they have a certain number of 'autistic' traits and as normal otherwise. Then 'autism' would almost certainly be socially constructed because the number of traits that they must have in order to count as having autism is an arbitrary, contingent social construction. If instead, autism is defined as possessing a certain neurological pathology then it seems that the term would not be socially constructed; instead, it would act more like a natural kind. (Hacking 1999, pp. 115-117). Thus, even deciding what to count as the referent 'autism' plays a part in the organic/physiogenic and constructivist/rationalist debates.

Flavours of Constructivism

Martin and Richards (1995) describe several different strategies for explaining scientific controversy, of which three are social constructivist. The group policies approach emphasises the importance of bodies such as governmental or professional organisations in sanctioning certain views or methodologies in scientific practice. The social structural approach instead places the emphasis on the power structures which exist between classes of actors. Thus, the power of the state, of the psychological profession, or of gender might be appealed to in order to explain the resolution of a controversy. The sociology of scientific knowledge (SSK) approach focuses on the micro-sociological interactions between actors. A key feature of this strategy is that of symmetry: the practitioner of SSK aims to be completely neutral with regard to the evidence and applies the same repertoire of sociological investigation to both sides of the debate irrespective of the (perhaps socially constructed) truth about their claims. In this section, I will briefly sketch how each of these three strategies might be applied to the controversy between Bettelheim and Rimland.

As a first attempt one might try to give a social structural account. One fascinating feature of this debate is that the actors involved in the debate are not just scientists (as in many controversies) but involve both professionals, the psychologists, and laymen, the parents. If we consider the relevant structure to be that of celebrity, education and stature, Bettelheim seems to have the clear advantage. As an acknowledged expert on child psychology, particularly on infantile autism, who published often in popular media, Bettelheim's views commanded respect in society at large. In contrast, Rimland and the other parents were relative unknowns. Yet Rimland's hypothesis eventually won out over Bettelheim's.

Surely Bettelheim could have used his clout to maintain his stature in the field (perhaps by publishing papers in respected scientific journals, mentoring future psychologists, and by using his popular image to benefit his side) and quash the competing hypothesis. But it seems that this particular application of the social structural theory leads to a counterfactual explanation.[2]

Alternatively, we might claim that the important factor is not a structure of celebrity, but rather the fine-grained relationships between individual scientists. While Bettelheim was visible on a mass culture stage, Kanner had much more respect amongst his colleagues in the community of psychologists (Dolnick 1998, p. 170-171). His repeated unwillingness to commit strongly to a particular position on the cause of autism would have carried much weight within the community. Thus, even though Bettelheim came out heavily in favour of a psychogenic origin for the disorder, within the field of psychology, his views did not command as much respect as those of other scientists. This SSK approach would thus emphasise that the 'refrigerator parents' theory, while popular and much hyped in the media did not have as much influence in the scientific community. Hence, the wait-and-see attitude prevailed and the development of new (socially constructed) theories of autism eventually won the day, bolstered by their support from important actors in the field. However, histories of science based on the close analysis of the SSK approach are difficult to conduct after the controversy has been resolved because scientists tend to present rationalist accounts of why the debate ended the way that they did. Collins has compared this difficulty as analogous to seeing

[2]This example is meant to show that constructivists engage in the same kinds of theory-influenced observation as scientists – a perfectly reasonable starting point for a social constructivist account turns out to be wrong. Like the scientist, the sociologist must pick and choose a theoretical framework which fits her observations. In this case, perhaps, the social structural account based on celebrity and stature does not fit the data.

how a model ship gets into the bottle when one only sees the final product (Collins 1975). Similarly, it would be difficult to gain access to the attitudes of psychologists who worked in the 1950s and 60s, while the debate was still active, because most of those who would have supported Bettelheim's side will have changed their attitudes to fit in line with the accepted ideas about the causes of autism.

Though the SSK strategy based on micro-sociological analysis is difficult to apply at such historical distance from the events, perhaps the best approach is what Martin and Richards characterise as group policies. Here we would claim that the important structure is not that of celebrity scientist, or of the interactions between actors in a social web but rather the clout of a large group of parents banding together to present a unified voice against the 'refrigerator parents' hypothesis about the cause of autism. Shortly after publishing *Infantile Autism*, Rimland was one of the founding members of what became the Autism Society of America. This grassroots, parent-led group immediately gained stature in the debate about the cause of autism. At the group's opening meeting, Kanner himself gave the keynote speech and 'acquitted' the parents from blame for their child's condition. On this approach, the sociologist of science would tell a story about how though the parents were at a disadvantage when paired one-on-one with doctors (social structures playing a role here), by banding together they were able to form a strong alliance. These alliances: with each other and as a group with external bodies such as government funding agencies eventually overpowered the alliances of Bettelheim and his colleagues and allowed Rimland's hypothesis to prevail.

Discussion

The explorations of various possible constructivist accounts above are left intentionally vague and unfinished. The purpose of this paper is not to develop a complete social constructivist account of the controversy about the causes of autism. Instead, I hope to show that any of the three approaches could be tweaked to provide a suitable social account of what actually settled the debate. And yet, despite providing an alternate explanation, the social constructivist cannot hope to refute the rationalist on her own terms. Nelson notices that both rationalism and constructivism can be used to provide consistent accounts of scientific controversies. He argues that constructivism can be very attractive, because it illustrates the social factors which influence experiment, observation, and theory production but that rationalists can also construct cogent accounts (Nelson 1994, p. 545)

This point is well illustrated in the controversy over autism. Even though the rationalist may betray her biases in valuing Rimland's methodology or data over Bettelheim's, she can still construct a retrospective story about why Bettelheim's theory was eventually rejected. For example, she can say that autism turned out to be a natural kind, caused from a distinct biological deficiency. Perhaps she will admit that the actual sequence of historical events was influenced by contingent social factors. But she will maintain that the underlying theory is ultimately constrained by the norms of external facts in the world as obtained using scientific methods. Meanwhile, the constructivist can rehearse her refrain that the very facts which the rationalist appeals to are always influenced by her own social factors and biases. But though both are internally consistent, neither side can unseat the other on its own terms.

As an example, I will consider the recent charges of fraud which have been levelled against

Bettelheim. Two biographies, by Sutton (1995) and Pollak (1997), have been written since Bettelheim committed suicide in 1990. Both sketch how Bettelheim intentionally padded his reports about autism with children which he knew suffered from similar though non-autistic disorders in order to be able to claim incredible success rates treating autistic children (Sutton 1995, pp. 331-332).

The constructivist wants to understand this fraud as 'the result of controversy, not its cause' (Sapp 1990, p. 23). Thus, Bettelheim's deceit was only really fraudulent after the controversy was settled and the winners pegged the label on his work. This position is consistent in the case of Bettelheim. Though from our current perspective, Bettelheim's ideas about autism, based on psychoanalytic interpretation of symbols may seem unempirical, at the time, the nature of autism was not a clearly defined kind. Hence, his deceit can be understood as being motivated by secondary, perhaps even unconscious, external factors – funding, recognition, desire for success – rather than as a malicious abuse of scientific methodology. His actions only become fraudulent when we start from Rimland's notion that autism is a specific biological pathology. Bettelheim explicitly denied this hypothesis. Thus, it was quite reasonable that he would apply the term more loosely. Fraud as a property of his work is only constructed by retrospective rationalists.

At the same time, the rationalist understands fraud precisely as the intentional abuse of methodology which the constructivist denies. Though Bettelheim may have had a different idea about the origins and nature of autism, the rationalist claims that our subsequent discoveries of genetic pre-conditions for autism indicate that Rimland was in fact, correct. Bettelheim knew that Kanner, Rimland, and others, were using the term 'autism' in a

specific, and narrowly defined way. Because Rimland turned out to be right, Bettelheim's decision to count children which he knew would not be considered autistic by the others means that his work is fraudulent according to the rationalist.

While social constructivism has given sociologists of science a rich and useful repertoire for explaining and describing scientific controversy, the rationalist also has a useful repertoire for explaining how and why science evolves as it does. The superiority of constructivism (releativism) or rationalism (scientific realism) cannot be determined on empirical grounds by scientists or sociologist/historians; it must be left to philosophy (Nelson 1994, p. 545). But until philosophers decide, both sides of the 'Science Wars' can continue to operate as productive and useful enterprises. The heated controversy between the two simply illustrates some fundamental differences between the ways that scientists and sociologists conceive of their work; and also that 'on the whole [the controversy is] quite unproductive, apart from the fact that [it is] conducted on highly personal lines'.

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