Takayuki Kanda's ATR lab built a robot named "ROBOVIE," and studied its interactions with human test subjects. ROBOVIE has a vaguely human shape with a head, arms, torso, and a wheeled undercarriage. It is also equipped with an antenna that tracks radio frequency identification (RFID) badges worn by the humans interacting with it. This allows the robot to easily identify the different people it comes into contact with. The ATR researchers believe that a robot is only seen as intelligent by its operators if it both performs actions and expresses its ability to function in a natural and human like way (Kanda et al., 2001). For instance, just having people interact with a robotic head or some other restricted design is not going to draw out affective interactions with the machine, but a robot with a complete body that can interact with users autonomously, "…lets observers easily attribute various intentions to the robot based on its gaze-related movement" (Kanda et al., 2001). The researchers at ATR had the robot interrelate with fifty nine subjects and then asked each of them to fill out a questionnaire. The respondents rated the robot on a seven point scale between twenty eight pairs of opposite traits, such as friendly-unfriendly, exciting-dull, intelligent-unintelligent, etc. They found that close contact with an expressive robot that could accomplish various tasks brought about the most favorable impressions in the subjects (Kanda et al., 2001).

In another set of experiments, the ATR Intelligent Robotics and Communications Lab took ROBOVIE to elementary schools for extended periods of interaction with students in the classroom (Kanda et al., 2004; Kanda and Ishiguro, 2005). The robot was able to interact with students in a modest way engaging with them in about seventy behaviors, including simple games, telling them secrets, giving hugs and kisses to them, and making other friendly gestures. Takayuki Kanda and Hiroshi Ishiguro have been able to design the robot to engage in simple conversations, it can speak some three hundred sentences and understand about fifty words (Kanda and Ishiguro, 2005). This design has proven to be engaging enough to interest some children in interacting with the robot for extended periods of time. In one experiment the robot was programmed gradually to give out more "secret' information about itself depending on the amount of time the student spent with the robot and this, along with the robots ability to call out student's names, proved to be a very popular set of behaviors with the students (Kanda et al., 2004). The students wore nametags that had an RFID transmitter in them so that the robot was able to know with whom it was it was interacting. This feature allowed ROBOVIE to track the number and length of interactions it had with various students and also to attempt to deduce the friendship relationships that existed between the students in the classroom, in which it achieved to some moderate success (Kanda et al., 2004). The ATR Labs' goal is to eventually create a robot that can interact with students in a friendly manner and help teach children in the classroom while building relationships with the students and to, "…help maintain safety in the classroom such as by moderating bullying problems, stopping fights among children, and protecting them from intruders" (Kanda and Ishiguro, 2005).

Takayuki Kanda and his fellow researchers have discovered a number of interesting things about the design of affective robotics technology. Foremost is the data they have gathered that suggests that both adults and children are willing to suspend disbelief and attribute real intelligence and friendly feelings towards these machines even at the modest level of behaviors that are possible with the technology of today (Kanda and Ishiguro, 2005; Kanda et al., 2004). They have also found that the appearance of the robot is important and that reactions to the robot change when they alter its outward appearance, even when the underlying programmed behaviors remain the same (Kanda et al., 2004).

3.2 Bootstrapping Affective Human Robot Interactions Through Anthropomorphism

Research in the social psychology of human robot interactions such as what we looked at in the last section have inspired other roboticists to attempt to harness the natural psychological tendencies of humans in the design of affective robots. Since it seems that we all tend to anthropomorphize objects in our environment, this fact can make the design of affective robots much easier to accomplish. For instance, Daniel Dennett has written persuasively on "as-if" intentionality, where we often find it expedient to treat certain things we are interacting with as-if they had real intentionality (Dennett, 1996). This trend also seems to extend to the emotional realm. When dealing with affective robots, people seem willing to treat the robot as-if it really did have some fondness for them even if the engineers that built the machine would never be willing to ascribe these emotions to the machine since they know the synthetic tricks they used to simulate the emotions in the machine.

We might want to push this idea philosophically and wonder if once we have a complete understanding of neuroscience, our so called 'real' emotions might not turn out to be of the as-if variety Dennett describes. But let us leave that to another day. What is important to our discussion of affective robotic design is that this trick does work and should be used in designing these machines. Still, it is important not to push this psychological tendency too far. Humans are willing to ascribe abilities to machines that the machines do not have, but only to a point. Brian Duffy of the MIT Media Lab Europe reminds us that we need not attempt to build ersatz humans that will be ultimately unconvincing, but that instead we need to balance the robots, "…anthropomorphic qualities for bootstrapping and their inherent advantage as machines, rather than seeing this as a disadvantage, that will lead to their success" (Duffy, 2003). In other words, successful affective robots will be machines that are designed to do what machines do best, but in a way that engages the users' natural anthropomorphizing tendencies to help embed that machine in the user's lifeworld. This means that affective robots are best when they elicit our natural human predispositions to grant personalities to the objects around us making it easier for us to interact with the technology.

The roboticist Mashahiro Mori describes an interesting psychological barrier that roboticist must contend with, which he calls the "uncanny valley" (Mori, 1970). The uncanny valley is found by graphing the level of human likeness with familiarity, as a machine becomes more similar to humans in likeness and function it will evoke more positive feelings of familiarity. But Mori claims that after a certain