Researchers registered surprise of their own when they found that newborns could apparently imitate others' behavior. Although infants have all the facial muscles needed to express basic emotions, the appearance of such expressions was assumed to be random.

However, research beginning in the late 1970s began to suggest a different conclusion. For instance, developmental researchers found that, when exposed to an adult modeling a behavior that the infant already performed spontaneously, such as opening the mouth or sticking out the tongue, the newborn appeared to imitate the behavior (Meltzoff & Moore, 1977, 2002; Nagy, 2006).

Even more exciting were findings from studies conducted by developmental psychologist Tiffany Field and her colleagues. They first showed that infants could discriminate between such basic facial expressions as happiness, sadness, and surprise. They then exposed newborns to an adult model with a happy, sad, or surprised facial expression. The results suggested that newborns produced a reasonably accurate imitation of the adult's expression (Field & Walden, 1982; Field et al., 1984; Field, 2010).

This result was questioned, however, when subsequent research found consistent evidence for only one movement: sticking out the tongue. And even that seemed to disappear around the age of 2 months. Because it seems unlikely that imitation would be limited to a single gesture of only a few months' duration, researchers began to question the earlier findings. In fact, some researchers suggested that sticking out the tongue was not imitation, but merely an exploratory behavior (Anisfeld, 1996; Bjorklund, 1997; Jones, 2006, 2007; Tissaw, 2007; Huang, 2012). The jury is still out on exactly when true imitation begins, although it seems clear that some forms of imitation begin early. Imitative skills are important because effective social interactions rely in part on the ability to react to other people in an appropriate way and to understand the meaning of others' emotional states. Consequently, newborns' ability to imitate provides them with an important foundation for social interaction later in life (Heimann, 2001; Meltzoff, 2002; Rogers & Williams, 2006; Zeedyk & Heimann, 2006; Legerstee & Markova, 2008; Beisert, 2012).

Several other aspects of newborns' behavior also act as forerunners for more formal types of social interaction that develop later. As shown in Table 2-6, certain characteristics of neonates mesh with parental behavior to help produce a social relationship between child and parent, as well as relationships with others (Eckerman & Oehler, 1992).

For example, newborns cycle through various **states of arousal**, different degrees of sleep and wakefulness, that range from deep sleep to great agitation. Caregivers become involved in easing the baby through transitions from one state to another. For instance, a father who rhythmically rocks his crying daughter to calm her is engaged with her in a joint activity that is a prelude to future social interactions of different sorts. Similarly, newborns pay particular attention to their mothers' voices, in part because they have become familiar with them after months in the womb. In turn, parents and others modify their speech when talking to infants to gain their attention and encourage interaction, using a different pitch and tempo than they use with older children and adults (DeCasper & Fifer, 1980; Trainor, Austin, & Desjardins, 2000; Kisilevsky et al., 2003; Newman & Hussain, 2006; Smith & Trainor, 2008).

TABLE 2-6 FACTORS THAT ENCOURAGE SOCIAL INTERACTION BETWEEN FULL-TERM NEWBORNS AND THEIR PARENTS

Full-Term Newborn	Parent
Shows a preference for particular stimuli	Offers those stimuli more than others
Begins to show a predictable cycle of arousal states	Uses the observed cycle to achieve more regulated states
Shows some consistency in time patterns	Conforms to and shapes the newborn's patterns
Shows awareness of parent's actions	Helps newborn grasp intent of actions
Reacts and adapts to actions of parent	Acts in predictable, consistent ways
Shows evidence of a desire to communicate	Works to comprehend the newborn's communicative efforts

Source: Based on Eckerman & Oehler, 1992.

states of arousal different degrees of sleep and wakefulness through which newborns cycle, ranging from deep sleep to great agitation