

by Tracy James

Heather Rupp, a researcher at The Kinsey Institute for Research in Sex, Gender, and Reproduction, uses a weather analogy to help explain her findings: “You might take along an umbrella in case it rains, but not cancel your plans because of it.”

“It” is information derived from Rupp’s research about how hormones affect the human brain when it comes to sexual decision making. For example, several of her studies have found that women consider sexual stimuli—primarily pictures—differently, based on the stage of their menstrual cycles. In one study, women’s neural responses suggested that they were more attracted to masculine men when they were most likely to conceive than during other stages of their menstrual cycle. Another study found that the neural systems related to women’s ability to distinguish between masculinized and feminized male faces (even when women were unaware that the faces differed on this dimension) were most active closer to the time of ovulation.

Rupp also notes the broader influence of hormones on our moods. “Hormones contribute to a more positive mood, not just influencing sexuality. In a better mood, a woman may be more adventurous, compared to times when she feels less outgoing. During the first half of her cycle, she may lean more toward reward-seeking behavior, while later in the cycle, the mood is more inhibited, more withdrawn.

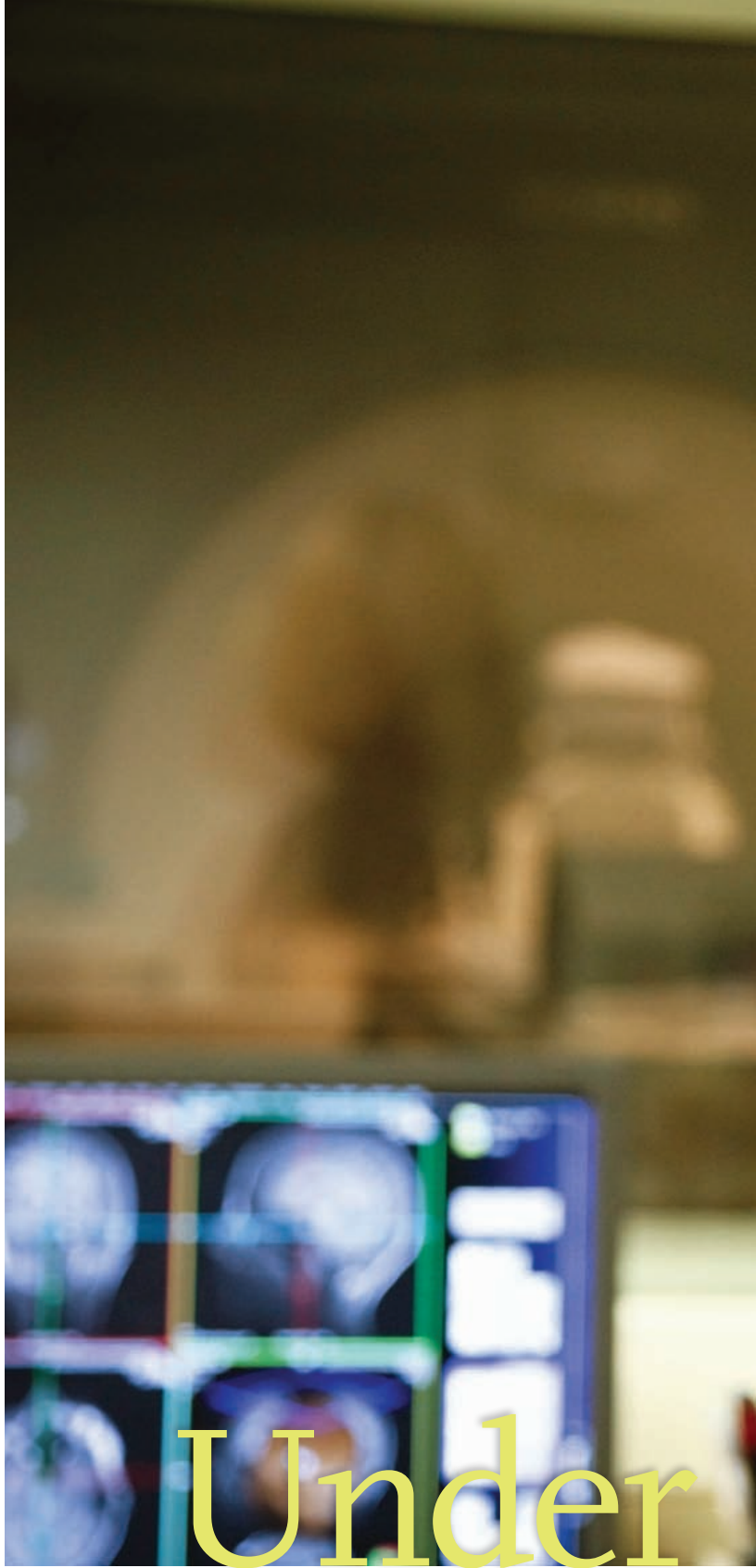
“Some people are hesitant to think that their behavior is in any way affected by biology,” continues Rupp, whose specialty is behavioral neuroendocrinology. “[But] evolution has directed us toward successful reproduction; it may follow that there is an internal system influencing—but not necessarily determining—our actions and emotions.”

So, do common sense or judgment—rather than hormones, pheromones, and other chemicals in our bodies—have anything to say about whom we’re attracted to, who we want to have sex with, or whether we act at all?

Yes, but it’s complicated. Rupp began her exploration of hormones and sexual behavior while conducting research on rhesus monkeys at Emory University. The relationship between hormones and sexual behavior among those primates was obvious, she says. With humans, it’s more complex. “In humans, it’s not just the hormones. It’s an intricate interaction of psychological factors, experience, and social influences, as well as hormones, that determine behavior,” she says.

Rupp came to Indiana University Bloomington three years ago to work with Ellen Ketterson, a Distinguished Professor of biology who directs the federally funded and Common Themes in Reproductive Diversity Training Grant program. Participating faculty and trainees across the Bloomington campus seek to identify aspects of reproduction that are similar, whether

Photo by Chelsea Sanders



they study humans, fish, lizards, small mammals, or insects.

Now an assistant scientist at the Kinsey Institute, Rupp’s research on hormones is regularly published in peer-reviewed journals and taken up by the popular press, no doubt because of what can only be described as a voracious popular appetite for understanding the “laws of attraction.” We all want to know who ogles whom and why.

While some of those “laws” seem intuitive or obvious, Rupp’s findings sometimes contradict conventional wisdom. One study that generated popular buzz found that when men and women looked at sexual photographs, the men were



the influence

more likely than women to look at the face rather than other body parts. Surprisingly, women were equally as interested in pictures of couples having sex. In another study, whether the study participant had a committed mate influenced how women viewed pictures of men, but did not influence how men viewed pictures of women.

While the public may be grasping for clues on how to understand the opposite sex, Rupp, who landed a National Institutes of Health grant in 2009, is more interested in basic science questions, which she pursues with a variety of colleagues.

Rupp works with a “dream team” of IU researchers. In ad-

dition to Ketterson, her collaborators include Julia Heiman, director of the Kinsey Institute; Thomas James and Dale Senglaub, both professors in the Department of Psychological and Brain Sciences, College of Arts and Sciences; and Erick Janssen, associate scientist at the Kinsey Institute.

“It’s a research playground,” Rupp says. “It’s fun to be able draw from all this rich and diverse expertise.”

[ABOVE] Heather Rupp is an assistant scientist at The Kinsey Institute for Research in Sex, Gender, and Reproduction. In her research, she uses the Imaging Research Facility in the College of Arts and Science's Department of Psychological and Brain Sciences at Indiana University Bloomington.

James, a cognitive neuroscientist, has guided fMRI studies and helped to analyze the astounding amount of data (two to four gigabytes) gathered from each test session. Sengelaub, also a neuroscientist, shares his research experience involving the spinal cord, sexual behavior, and hormones. Ketterson studies hormones from a more behavioral and evolutionary biological perspective. Heiman and Janssen are widely known for their research involving sexual behavior.

Rupp herself is a key player in this research collaboration. Ketterson credits her “focus and energy.”

“With Heather taking the lead, we began to address how birds and humans weigh potential partners for reproduction,” Ketterson says. “In my own research, for example, I have found that hormones mediate male behavior in ways that influence how a female chooses a mate. Some of Heather’s interesting findings on humans suggest that female hormones can influence both brain activation and mating preferences, sometimes in ways we humans are not aware of.”

strual cycle, and she is interested in applying these findings to different populations. Risk-taking behavior, for example, is a hot topic in HIV research. Rupp also recently submitted a grant to study more closely the influence of hormones related to risk-taking in women with alcohol dependency. It could be, she says, that the follicular stage of the menstrual cycle, close to ovulation, is a tricky time for women who are prone to risk-taking. It’s possible that programs to help alcoholics could take this timing into consideration.

Rupp’s recent NIH grant will allow her to study hormones related to postpartum depression. This research is a nod to her collaborators and their shared interest in parental behavior across taxonomic lines. Male birds, like humans, form strong pair bonds with their partners and participate in parental care; female birds form strong bonds with their offspring. One of the same hormones that help to mediate these bonds in birds may also play a similar role in humans, fostering calm in mothers of newborns and making them more resistant to sources of stress.

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Early in her research career, Rupp knew she was interested in how hormones affected cognition and the brain. Now with a focus on sexual behavior, she says, she can see the pieces fitting together from what is known about other behaviors. Sexual decision making, for example, involves attention, evaluation of risk and reward, and other general neural processes. While limited neural models exist for human sexual decision making, Rupp says the neural systems corresponding to high-risk sexual behavior appear to be the same ones corresponding to high-risk economic decision-making. “All we have to do is prove this,” she says.

In one of her studies, Rupp found that when a woman was near ovulation, one reward-sensitive area of her brain, the orbitofrontal cortex, showed increased activation in response to men in general. Other stimuli that arouse this area of the brain include drugs, alcohol, and gambling. Also, brain regions related to reward and risk-taking responded differently to faces of men with more masculine features and were most responsive closest to ovulation, when a woman is most likely to become pregnant.

At this point in her research, Rupp says predictions can be made about how decision making changes across the men-

“The different points of view and backgrounds of our group have, I hope, played a role in stimulating Heather’s elegant experimental designs, which are being recognized by the NIH,” Ketterson says. “We hope her research will ultimately be helpful to mothers, infants, and extended families.”

Rupp and her colleagues are also looking at how birth control methods that affect hormone levels influence women’s neural responses during sexual decision making. Women who take the pill, Rupp says, have not shown the fluctuation regarding male preferences seen in other women.

“Because the field is so wide open and we know so little, it’s exciting to take the first stab to see what’s going on, what’s contributing to how these neural systems respond, and then to be able to ask more relevant questions,” she says.

Just how much hormones influence the “mating game” remains unclear because of the many social, psychological, and experiential influences that go into the process. Individual variability, says Rupp, is the crucial question.

“For some people, the influence of hormones can be really strong. For some women, it’s more about experience. Different physical and psychological components contribute different weight for everyone,” she says. “Ideally, you find someone you like through the whole month.”

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