Hooked on a feeling

A small, almond-shaped brain structure called the amygdala continues to attract the attention of neuroscientists interested in how the brain mediates emotion and social judgment. A number of studies in animals and people have indicated that the amygdala helps to coordinate fear conditioning and the recognition of fearful and angry faces (SN: 1/18/97, p. 38). Now, four investigations of human volunteers have examined more closely the amygdala's role in learning and remembering fearful images.

Different regions of the amygdala become active, depending on whether a person consciously or unconsciously perceives an angry face, report Raymond J. Dolan of the Institute of Neurology in London and his colleagues. The researchers used positron emission tomography (PET) scans to measure neural responses in 10 men who viewed pictures of two angry-looking faces. In earlier trials, each participant had learned to associate one of the faces with the onset of an uncomfortable burst of noise.

During selected PET sessions, researchers blocked the volunteers' awareness of having seen the angry faces—each shown for a fraction of a second—by flashing an expressionless face immediately after an irate one. In previous work, people who reported no awareness of angry faces presented in this way nevertheless exhibited physiological signs of fear.

Unconscious perception of an angry face that had previously been linked to a loud noise elicited marked rises in neural activity on the amygdala's right side, the scientists observe in the June 4 NATURE. Explicit awareness of the same face heralded enhanced responses on the amygdala's left side.

In the May NEURON, researchers led by the Institute of Neurology's Christian Büchel report that neutral-looking faces paired with loud noises energize the amygdala as well as several areas in the brain's outer layer, or cortex. Neural responses to these faces, tracked over repeated presentations with functional magnetic resonance imaging (fMRI), quickly peaked and then declined in the amygdala but remained high in the cortex.

Another fMRI investigation described in the same issue uncovered elevated amygdala activity in the early stages of learning, whether acquiring or shedding fear responses to a visual image (not a face) paired with a mild electric shock. Individuals exhibited large differences in the extent to which the right or left side of the amygdala reacted during these trials, report Kevin S. LaBar of Yale University and his colleagues.

A fourth study, also in the June 4 NATURE, implicates the amygdala in the retrieval of socially relevant knowledge based on other people's facial expressions. Three adults who had suffered damage to the entire amygdala rated a series of 100 faces presented in photographs as far more approachable and trustworthy than did 7 people with partial amygdala damage, 10 with damage to other parts of the brain, and 46 with no brain damage. The greatest disparity in social judgment occurred with faces deemed particularly unapproachable and dishonest by the comparison groups, report Ralph Adolphs of the University of Iowa College of Medicine in Iowa City and his colleagues.

Although access to social and emotional information appears to require an operational amygdala, brain-scan results remain difficult to interpret, remarks Steven E. Hyman, director of the National Institute of Mental Health in Bethesda, Md., in a comment published with the NATURE reports. Even fMRI, which generates images in a few seconds, lags behind the fervent pace of brain cell activity, he notes.

Another problem arises from the ease with which small changes in experimental procedures alter neuroimaging results, as evidenced by variations in left- and right-amygdala activity observed in the new studies, Hyman says. —*B.B.*