order across the domain boundary, even though most of the boundary structures yield positive boundary energy of around 0.01 eV $Å^{-1}$. The fact that C_{60} forms orientationally ordered domains suggests that the magnitude of the domain energy variation sets the upper bound of the rotational barrier due to the monolayer substrate. However, an absence of positional and bond-orientational domain walls, such as those in noble gases adsorbed on graphite[8], implies that the lateral variation of the substrate fields is much smaller than the C_{60} intermolecular potential. We conclude that the novel topological order observed here must be an intrinsic property of a two-dimensional system.

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Neurology

Self-recognition and the right hemisphere

Although monkeys can perceive complex stimuli such as faces[1], only the higher apes are capable of recognizing their own face in a mirror[2]. Here we show that in humans the right hemisphere of the brain seems to be preferentially involved in self-face recognition. Our findings indicate that neural substrates of the right hemisphere may selectively participate in processes linked to self-awareness.

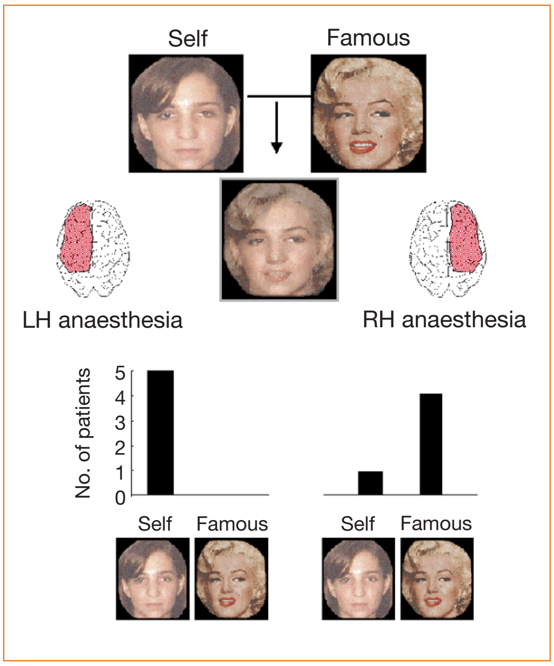

Figure 1 Five patients (a real patient is not shown) were presented with a picture showing a morph of a face that was composed of their own face and a famous face during the time when either the right or the left hemisphere of their brain was anaesthetized. Following anaesthesia of the left hemisphere (LH), patients selected the 'self' face as having been shown to them (5/5); after anaesthesia of the right hemisphere (RH), patients selected the famous face as the one they had viewed (4/5). In a second experiment with 10 normal subjects (results not shown), transcranial magnetic stimulation was delivered to the motor cortex of the RH or LH during self–famous or familiar–famous morph display. The amplitude of the resulting motor-evoked potentials (MEPs) was significantly greater for the RH than for the LH during presentation of self morphs ($M=1.26$ mV and $M=1.02$ mV; s.e., 0.09, respectively) and the former (RH, self morph) was also significantly greater than the MEP amplitude from both hemispheres during presentation of familiar morphs (RH, familiar: $M=1.04$ mV, s.e., 0.07; LH, familiar: $M=1.03$ mV, s.e., 0.08).

We first studied a group of patients undergoing the intracarotid amobarbital (Wada) test. The Wada test involves anaesthetization (that is, inactivation) of one cerebral hemisphere in order to provide information regarding cerebral dominance for language and other cognitive phenomena. Five right-handed (left hemisphere is language-dominant) patients, who were undergoing Wada tests for evaluation for surgery to treat epilepsy, were shown pictures of faces generated by morphing the picture of a famous person with the patient's own face (Fig. 1). Patients were instructed to remember the picture presented. Different pictures were presented during selective anaesthesia of the right and the left hemispheres.

After recovery from anaesthesia, patients were given a forced-choice task in which they had to choose the picture of the face that they had been shown. The two choices were the pictures from which the morphed image had been generated (self and famous), although neither choice had actually been presented during anaesthesia. Following anaesthesia of the left hemisphere, all five patients selected the 'self' face as the one they thought had been presented; however, after anaesthesia of the right hemisphere, four out of the five selected the famous face. These results suggest that the anterior right hemisphere may be critically engaged in detecting the self face.

To find out whether a similar effect operates in normal subjects, we presented morphed photographs to ten volunteers (instructed to attend to the photographs) and delivered transcranial magnetic stimulation to the motor cortex of the left or right hemisphere at random times (100–450 ms) during picture presentation. We measured the amplitude of the motor-evoked potentials induced by this stimulation in the contralateral first dorsal interosseous muscle as an indicator of the amount of activation of each hemisphere[3] during exposure to pictures morphing their own or a familiar face with that of a famous person.

We found that there was a significant association ($P<0.05$) between subjects' hemisphere activation and their exposure to the 'self'and 'familiar' conditions. Post-hoc Bonferroni tests revealed that motor-evoked potentials were significantly greater from the right hemisphere while subjects viewed pictures containing elements of their own face than for all other conditions.

Some people can suffer from neglect or misidentification of their own extremities (a condition known as asomatopagnosia) after damage[4] to or anaesthetization[5] of the right hemisphere. It is also known that patients with lesions to the right fronto-temporal cortex may experience a cognitive detachment from self[6]. This recently evolved network includes prefrontal regions of the brain and demonstrates a high degree of lateralization[7] in humans and apes, but not in monkeys. It is conceivable that a right-hemisphere network gives rise to self-awareness, which may be a hallmark of higher-order consciousness[8].

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