

The Oxford Companion to
The Body

Editors

Colin Blakemore and Sheila Jennett

Section editors

Alan Cuthbert

Roy Porter

Londa Schiebinger

Tom Sears

Tilli Tansey

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the larynx at the front, is the U-shaped *hyoid bone* that provides support and moves upwards with the larynx during swallowing. Halfway down the larynx the paired vocal folds (commonly known as the *vocal cords*), formed by ligaments covered with mucous membrane, project inwards from its wall. The vocal folds form a 'V' shape, open towards the back. At the rear end of each vocal fold are the small *arytenoid cartilages*. Many small muscles are attached to these, and their action can vary the size of the aperture, by pulling the arytenoids apart or drawing them nearer together, widening or narrowing the 'V'. This movement occurs rhythmically during inhalation and exhalation in regular quiet breathing. Closure of the glottis occurs only momentarily during swallowing; abnormally, near-closure (*laryngospasm*) seriously obstructs breathing and causes *stridor* — high-pitched and noisy breathing.

During speech, SINGING, or playing a wind instrument, the size of the aperture is narrowed and varied, to produce sounds of different pitch. This increased resistance to airflow out of the lungs converts the flow to a rapid pulsation as it passes between the vocal folds; this produces sound that is then modified by the upper vocal tract.

MARJORIE P. LORCH

See PLATE 3.

See also BREATHING; SINGING; SPEECH; VOICE.

Laughter and humour Charles Darwin noted in the 1870s that certain bodily movements and FACIAL EXPRESSIONS occurring during emotional states are similar in people around the world, independent of cultural or other differences. Laughter, a behaviourally stereotyped, staccato vocalization, is a case in point. Laughter emerges by around 4 months of age, long after the ability to smile or cry, and eventually co-occurs with speech. As an overt behavioural marker of humour, laughter signals an affective state of mirth or joy, although it does not exclusively signal this state: it may also signal anxiety or embarrassment (as in nervous laughter), derision, or even agreeableness (as in polite laughter at Oxford high tables). Uncontrolled, involuntary bouts of laughter in situations in which laughter would be inappropriate have occasionally been reported in patients with certain kinds of brain injury — especially injury to the parts of the frontal lobes.

Mirthful laughter is triggered by a variety of verbal and non-verbal situations. What may strike one person as extremely funny may be perceived by another as only mildly so, if amusing at all. In part because of the extreme variability of stimuli and response, the phenomenon of humour has not, until recently, been studied experimentally, despite being a long-standing interest among philosophers, writers, psychoanalysts, and sociologists. Indeed the very complexity of the phenomenon has led to a recognition that an adequate understanding of what makes something humorous will require a joint consideration of at least three levels of analysis:

the cognitive, the social, and the affective. On the cognitive end, the notion of incongruity, or what Arthur Koestler has termed 'bisociative thinking' has been seen as central to humour perception. That is, humour is thought to involve an abrupt realization that a particular belief or expectation about a situation is not the only way of perceiving the situation. While incongruity recognition is thus seen to be necessary for humour to be perceived, it is not sufficient: for something to be perceived as humorous, rather than as threatening, the new interpretation should be seen to have trivial rather than terrifying implications, and should bring in absurd, playful, and/or indiscreet elements into an otherwise 'serious' scenario. Thus, the affective aspect of humour stems both from the pleasure of 'getting' the joke and the relief from the recognition that it is, after all, only a joke — that the danger is not real. Finally, the social aspect of humour resides in the fact that what is considered laughable will depend on shared beliefs and implicit norms, concerning the extent to which these beliefs can be temporarily called into question and subjected to a reinterpretation through humour. Indeed there may be no better way to 'calibrate' the social mores of a new group you are introduced to than by telling them jokes.

There can be both physiological and psychological benefits from laughter. It requires the coordinated action of 15 facial muscles and the thoracic cavity. It produces spasmodic SKELETAL MUSCLE contractions, tachycardia, changes in BREATHING pattern, and an increase in CATECHOLAMINE production. Hearty laughter increases heart rate, BLOOD PRESSURE and respiratory rate, and muscular activity. Many of the physiological changes associated with laughter are beneficial ones. For example, the increased ventilation and clearing of mucus may aid patients with chronic respiratory conditions such as emphysema. The increased heart rate and blood pressure that accompanies laughter can exercise the myocardium and increase arterial and venous circulation. It has been suggested that this in turn allows an increased movement of OXYGEN and nutrients to tissues and facilitates the movement of immune elements and PHAGOCYTES, thereby aiding the body in fighting infections. The enhanced venous return helps to reduce vascular stasis and may lower the risk of thrombus formation. Muscle relaxation following bouts of hearty laughter may break the spasm-pain cycle in patients with neuralgias or rheumatism. A reduction in laryngeal muscle tension associated with laughter may help patients with vocal fold pathology to produce a more relaxed voice. Laughter also appears to aid the recovery of phonation in patients with psychogenic dysphonia, a puzzling disorder characterized by an inability to phonate during speech despite intact articulation and no identifiable pathology of the larynx. Finally, the increased catecholamine levels associated with laughter may be responsible for beneficial effects of humour on mental functions, such as alertness and creativity. (But despite the far-reaching claims, these appear

to be nonspecific 'benefits' and it is not clear why laughter should be any more beneficial in this regard than playing cricket.)

A number of psychological benefits have also been claimed for laughter and humour. Humour is said to loosen boundaries between strangers and strengthen bonds between friends and intimates. It provides a way of allowing people to mask deficiencies or disclose vulnerabilities. It is also thought to increase flexibility in thinking, foster solidarity and intimacy, and provide an alternative to despair.

Theories about the functional significance of humour have ranged from psychoanalytic, through social/anthropological, to cognitive, and even metaphysical accounts.

Psychological theories

According to Freud, humour makes possible 'the satisfaction of an INSTINCT (whether lustful or hostile) in the face of an obstacle that stands in its way'. Thus, the PLEASURE in a joke arises from the savings in psychic energy made possible by the relief from conscious monitoring. The association of humour with aggressive or sexual impulses has also characterized many subsequent accounts of humour — fuelling debate over whether hostility is an inherent element. Proponents of the so-called *superiority theory* (Aristotle, Plato, Hobbes, and Bergson) view humour as reflecting a moral stance on the part of the humorist. As described in Hobbes's *Leviathan*, 'The passion of laughter is nothing else but sudden glory arising from a sudden conception of some eminency in ourselves by comparison with the infirmity of others, or with our own formerly.' Superiority may be revealed not just by laughing at others' deficiencies but also by showing that one can laugh at (and rise above) one's own imperfections. For Henri Bergson, humour 'consists in perceiving something mechanical encrusted on something living'; laughter asserts the human values of spontaneity and freedom and thus erupts whenever a person behaves rigidly, like an automaton.

Social/Antropological theories

The social significance of laughter and humour has been emphasized (for example by Konrad Lorenz). Laughter has been regarded as a marker of group membership and solidarity for those who share a joke, and of exclusion for those who are the 'butt' of the joke, thus providing a means of maintaining social control and group cohesiveness.

Cognitive theorists

Cognitive theorists of humour include Kant and Schopenhauer (two singularly humourless German philosophers) and the Gestalt psychologist Norman Maier. They have focused on describing the mechanisms that underly humour processing. From a cognitive perspective, humour is thought to arise from a sudden 'paradigm shift' — a restructuring of an internal mental model upon recognizing some ambiguity, inconsistency, or contradiction in a situation. That is, we experience humour when we become

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aware of a discrepancy between what is expected and what is experienced — but only if that discrepancy turns out to be non-threatening.

Evolutionary hypotheses

Evolutionary hypotheses have speculated on the possible adaptive significance of human laughter and humour. They fall into five groups:

Humour as a temporary disabling mechanism laughter disrupts the status quo. While laughing we, quite literally, are rendered incapable of thinking of, let alone doing, anything else. This may have been evolutionarily useful in that it gets us out of a routine or fixed way of thinking, thus enabling a creative approach to problem solving.

Humour as social learning the origins of humour have been traced to the laughter of young primates and children in response to tickling and play. Thus Weisfeld notes that 'the pleasure of humour motivates us to seek out fitness-enhancing input' and that laughter is 'a pleasant social signal that prompts the humorist to persist in providing this edifying stimulation'. However the proposition that participating in play and humorous interactions in fitness-relevant situations (such as sexual, aggressive, or other social interactions) aids in social learning, does not explain why humour (rather than, say, gossiping, or fantasizing) is necessary for such instruction.

Humour as status-manipulation the notion that mirthful laughter creates and strengthens group boundaries is at the centre of a theory of humour proposed by Alexander; humour developed as a form of ostracism, providing a means of manipulating status within a group. Ostracism in turn has repercussions for reproductive success. According to this view, humour functions primarily as a means of creating solidarity among some members of a group by excluding or demeaning others. These notions echo those described above under social learning, since they suggest that humour is a form of social scenario-building, providing an edge in learning how to negotiate in 'fitness-relevant' domains. However, the question remains as to why humour *per se* is necessary or useful in accomplishing the goal. Why are humorous put-downs needed when direct criticism or insults could suffice?

Humour as vocal grooming the theory of language as a vehicle for social bonding through its origins in grooming and gossip has interesting implications for an understanding of humour. Inasmuch as LANGUAGE facilitates social bonding, humour in language may offer a shortcut to forming deep, affectional ties with those with whom one discovers and tacitly cultivates a common ground. 'Finding the same thing funny is not only a prerequisite to a real friendship, but very often the first step to its formation' (Konrad Lorenz). The fact that much of conversation is punctuated by laughter and that laughter releases endogenous opiates suggests that humorous discourse may have arisen as a means for eliciting more laughter, in the service of social bonding.

Laughter at a false alarm the present author has proposed that laughter allows the individual to alert others in a social group (usually kin) that a detected anomaly is trivial, that there is no real danger and therefore nothing to worry about. The laughter (and its spread within the group) announces that there has been a false alarm, that the rest of the community need not waste precious energy and resources responding to a spurious threat. In this view, an individual's nervous laughter may be seen as an internalized reaction to stressful situations: a way of distracting oneself from one's anxiety by setting off one's own false-alarm mechanisms. Similarly, the smile may be seen as a weaker form of laughter — an aborted orienting response, signalling 'I know you pose no threat'. The same line of reasoning may explain why people laugh when tickled: a potential threat turns out not to be one.

Clues to the neural mediation of laughter and of humour have come mainly from clinical reports of their disorders. Patients with damage in the right cerebral hemisphere show preserved sensitivity to the surprise element of humour but a diminished ability to establish narrative coherence. Disorders of humour such as foolish or silly EUPHORIA and a tendency toward making inappropriate jokes have also been reported in patients with damage to the frontal lobes. Deficits in humour appreciation are more common in patients with right frontal damage, supporting a view that the right frontal lobe serves an important role in responding to 'anomalies'. Disorders of laughter can occur independently of disorders of humour. They are most commonly associated with the type of STROKE known as *pseudobulbar palsy*, when laughter can be intermixed with crying. A sudden display of laughter has been reported to precede acute strokes. And 'gelastic' (laughing) seizures originating from the left hemisphere (typically resulting from a rare tumour in the hypothalamus) are another manifestation of pathological laughter. Although infrequent, disorders of laughter are almost always associated with abnormal activity in, or damage to, parts of the brain that are components of the LIMBIC SYSTEM; given the well-known role of the limbic system in producing an orienting response to a potential threat or alarm, it is not altogether surprising that it is also involved in the aborted orienting reaction in response to a false alarm — namely, laughter. There is also evidence that particular regions of the cortex of the temporal lobe are associated respectively with the affective side of laughter (the feeling of merriment that accompanies it), whereas others are involved in the motor act of laughter itself.

Research on the brain bases of humour and laughter has depended largely on the study of clinical cases. Whilst this is provocative, there is clearly also a need for experimental research to examine more fully the neurophysiology and neuropsychology of laughter and humour.

J. VAID

V. S. RAMACHANDRAN

Further reading

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See also EMOTION; FACIAL EXPRESSION; PLEASURE; SMILING.

Learning disabilities What connections exist between the body and 'learning disability' or 'mental retardation'? We assume that there is a realm of mental nature separable from physical nature, at least for investigative purposes; we also often see mental disorders as being analogous to physical ones, or physical conditions as causing mental ones. We assume that mental ability or disability is a part of an individual's make-up, and therefore that what is congenital is also largely incurable. All these assumptions are modern, in the historian's sense of the term: they belong to the last three centuries.

According to GALEN, the supreme medical authority before modern times, human reason was activated by 'animal spirits' which moved around the brain and, if sluggish, caused *amentia* (mindlessness); however, any normal individual could experience this condition temporarily. Sometimes a landowner's heir might suffer from congenital incompetence, but this was a problem for lawyers, not doctors; it was not distinguished from the assumed incompetence of the entire labouring population, and where people did not own property there was no problem. Nor was congenital incompetence necessarily permanent: God might cure it providentially. People whom we might now call 'learning disabled' were depicted by artists; but neither their behavioural gestures and bodily features, nor their social role, were clearly distinct from those of jesters and professional fools whose minds were perfectly sound. Medical writers did not research the causes of mental (or physical) monstrosity, since these were God's responsibility; rather, monstrosity demonstrated His marvellous creative powers. Only mavericks among them, such as astrologers or followers of the derided Paracelsus, had a specifically medical interest in connections between the body and permanent lack of reason. Even for them, reason tended to mean divine illumination rather than the personal mental equipment described by modern psychology.

In the seventeenth-century roots of that psychology we begin to find a learning disabled type recognisable to ourselves, defined by the purely mental characteristics of an individual. The influential philosopher John Locke summarized these as a lack of ability to think 'abstractly', and