1a). AI's head movements have a saccadic pattern; most are rightwards with a few regressive movements. The forward fast movements have a modal size of six characters, and fixations have a normal average duration of 200 ms (Fig. 1b). In addition, AI makes the characteristic large return movement at the end of each line.

The saccade/fixate characteristic of eye movements is not restricted to reading, but is used in a range of visual scanning situations[4] such as viewing a picture (Fig. 1c). Like Yarbus's original subjects, AI orients to locations of interest in the picture in a saccade-like manner, showing that her saccadic head movements are not restricted to reading and seem to be her general orienting mechanism.

Although AI's deficit is a peripheral one, her case suggests that saccadic movements, of the head or the eye, form the optimal sampling method for the brain. Given the additional mass of the head, and the non-specialization of the head in humans to make small saccadic movements (although such movements are common among other species[5]), the fact that such saccadic movements are adopted as an adaptive strategy by this subject indicates that the costs of adopting a new sampling strategy, such as smoothly scanning the display, outweigh the costs of moving the whole head in a saccade-like fashion many thousands of times a day.

When making large orienting movements, unimpaired subjects make combined head and eye movements. Recent physiological studies of these combined head and eye movements have focused on the role of the superior colliculus[6], a midbrain region known to be important in visually guided motor action. Stimulation of neurons in the intermediate and deep layers of the superior colliculus of the rhesus macaque can lead to combined head and eye movements, demonstrating a projection from the superior colliculus to the head control centre in the brainstem. Such results suggest that an adaptation of neural function in the superior colliculus could be responsible for the total transfer of saccadic movements from the eyes to the head shown by this subject.

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Site of particle selection in a bivalve mollusc

Bivalve molluscs form dense populations that exert profound effects on the particle loads and phytoplankton composition of coastal waters[1]. It has long been known that bivalves can select among different particle types, including selecting against those of poor nutritional value[2–5], but because of difficulties in observing particle transport processes in the pallial cavity *in vivo*, the mechanism of selection was not known. We now use a combination of video endoscopy[6] and flow cytometry[7] to show that oysters can select living particles from non-living detritus on the gills. Our methods could aid the study of suspension feeding in many animal groups.

Oysters dominate estuarine bivalve assemblages throughout the world and form dense reefs that may strongly affect the seston of estuaries[8]. To determine whether oysters can select among the mixture of living and non-living particles, we studied the western North Atlantic (*Crassostrea virginica*) and the Pacific (*C. gigas*) oysters. We observed particle transport directly using a surgical endoscope, and with the aid of a micromanipulator we positioned a sampling pipette to sample particles from ciliated transport tracts. We distinguished and counted particle types using flow cytometry.

We fed the oysters a mixture of two equally sized but qualitatively different particle types, the red-coloured microalga *Rhodomonas lens,* and ground dead leaves and stems of the cord grass *Spartina alterniflora.* The *S. alterniflora* had been lying above the highest extent of the tide for at least four months and presumably was less nutritious than the living microalgal cells. *Spartina* spp. salt marshes line the fringes of most eastern North American estuaries and *Spartina* spp. detritus is an important component of the seston[9].

Oysters have a plicated, heterorhabdic gill with principal and ordinary filaments that allow transport of particles dorsally or ventrally on the gill. Particles may be moved dorsally on the gill to a ciliated tract that drives particles anteriorly in a slurry. Alternatively,
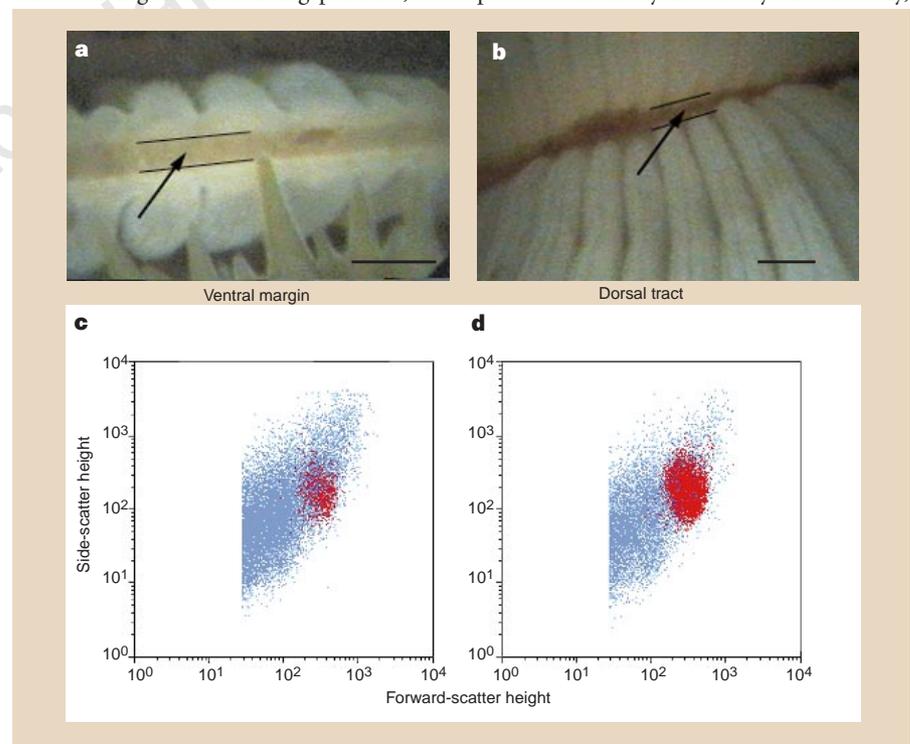

Figure 1 Feeding selectivity by oysters. **a,** Frame from video of the ventral ciliated tract of *C. gigas,* showing concentration of beige *S. alterniflora* detrital particles. **b,** Dorsal ciliated tract, showing concentration of red *R. lens* algal particles. **c,** Flow cytometric plot for *C. virginica* showing relative abundances of *R. lens* (red) and *S. alterniflora* detrital particles (blue) in the ventral margin, and **d,** from the dorsal tract. *C. virginica* (Friday Harbor Laboratories) and *C. gigas* (Southampton College Marine Laboratory) were exposed in a static chamber to 10^4–10^5 cells per litre, roughly equally distributed between live *R. lens* and detrital *S. alterniflora* particles. Particles were sampled after equilibration (30 min). Pseudofaeces were sampled and disaggregated for analysis. Particles were analysed by flow cytometry (Becton Dickinson FACScan bench-top flow cytometer) using detectors for forward scatter, side scatter, chlorophyll (fluorescence >650 nm), and phycoerythrin (fluorescence 560–590 nm). Heterogeneity among sorting efficiencies was significant (Krustal-Wallace test, $P < 0.05$), showing positive selection for *R. lens* in the dorsal tract and enrichment of detrital particles in the ventral tract and pseudofaeces.

particles may be moved ventrally towards a ciliated tract that transports particles anteriorly in a cohesive mucus string. Both tracts transfer particles to the labial palps[10].

Although roughly equal amounts of *S. alterniflora* detritus and *R. lens* microalgal cells were fed to the oysters, the rejected material in the form of pseudofaeces was strongly enriched in detrital particles (Fig. 1), indicating strong selection in favour of living particles. Video endoscopy revealed a strong differential selective transport of material enriched with *R. lens* towards the dorsal tract and material enriched with dead *S. alterniflora* particles towards the ventral tract. The latter tract transferred particles to the labial palps, and then rejected them as pseudofaeces. By contrast, the contents of the dorsal tract were transferred to the palp for further processing. Direct sampling between the palp lamellae showed that little additional sorting occurred and presumably the unaffected slurry of *R. lens*-dominated particles was transferred to the mouth.

If *R. lens* or *Tetraselmis* sp. (a green microalga) particles were fed alone to the oysters, nearly all algae were transported to the dorsal ciliated tract. Similarly, if detrital *S. alterniflora* particles were fed alone, the oysters seemed to transfer most of the material to the ventral tract, eventually to be rejected. This would suggest that the decision to accept or reject particles is not contingent on the presentation of a choice to the bivalves. On the other hand, preliminary evidence suggests that after four hours of feeding on microalgae, *R. lens*-rich material is redirected towards the ventral tract. This suggests that gut fullness might influences rejection of even good particles after a period of time.

Our results show that oysters can differentiate between nutritious and detrital particles. The mechanism is not based on particle size, but may be related to chemical cues, perhaps related to properties of the particle surfaces. Because oysters are strong interactors with estuarine ecosystems, this ability to differentiate between particle types should have profound effects on the composition and level of the seston, especially where resuspension brings rejected pseudofaeces back to the water column. Endoscopic examination and determination of the locus of sorting provides a direct connection between individual function and processes at the ecosystem level.

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In-store music affects product choice

Royalty payments for non-broadcast commercial uses of music in 1995 amounted to £53.8 million in the UK alone[1]. Research on music and consumer behaviour[2,3] has, however, almost completely ignored the potential effect of in-store music on purchasing and particularly on product choice. By investigating the purchasing of German and French wines we have found that musical 'fit' has a profound influence on product choice.

Specific musical pieces may activate superordinate knowledge structures[4], suggesting how in-store music could influence product choice. For example, stereotypical French music should activate superordinate knowledge structures concerning France, so priming the selection of products such as French wines. Similarly, stereotypical German music should activate related knowledge and prime the selection of products such as German wines.

To test this, four French and four German wines were displayed in a supermarket drinks section. The wines were matched between the countries for their price and dryness or sweetness. Each of the four shelves contained one French and one German wine and appropriate national flags. The position of the wines on the shelves was changed halfway through the two-week testing period. French accordion and German Bierkeller pieces were played on alternate days from a tape deck situated on the top shelf. Shoppers buying wines from the display were asked to complete a questionnaire by two experimenters posing as customers, with 44 shoppers (54%) consenting and the rest typically offering constraints on available time as a reason for declining.

French wine outsold German wine when French music was played, whereas German wine outsold French wine when German music was played ($P < 0.001$) despite an overall bias in favour of French over German wine sales (Table 1). Questionnaire responses indicated that the French music made respondents think of France and the German music made them think of Germany ($P < 0.001$). Respondents did not differ in their general preference for wines from these two countries ($P > 0.05$), and only six respondents answered "yes" to the question, "Did the type of music playing influence your choice of wine?".

Customers did not seem aware of the effect that music had on their selections. Given recent controversy over subliminal perception[5] it would be interesting to discover whether they were really as unaware of the effects of muscal 'fit' as their questionnaire responses suggested. Future research could investigate the effects of music relative to silence, or relative to the effects of music from a country that does not produce wine; the mediating effect of individual differences[6]; and whether musical 'fit' has more influence on product choice when customers are undecided[7].

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Table 1 Summary of results by type of music

	When French music played	When German music played
Bottles of French wine sold	40 (76.9%)	12 (23.1%)
Bottles of German wine sold	8 (26.7%)	22 (73.3%)
Extent to which music made respondents think of France (0 = not at all, 10 = very much)	6.25 ± 3.34	2.5 ± 3.68
Extent to which music made respondents think of Germany (0 = not at all, 10 = very much)	1.52 ± 2.08	6.08 ± 3.73
Usual wine preference of respondents (0 = French, 10 = German)	3.54 ± 3.44	5.58 ± 2.78

Ratings from the questionnaires were on a scale of 0 to 10. Mean ratings ± s.d. are given.