An explanation for the elusive quality of the Mona Lisa's smile is advanced: "her smile is...more apparent to peripheral vision than to central vision....you can't catch her smile by looking at her mouth." **Claims that inclusion of rats, mice, and birds in the Animal Welfare Act will increase animal-care costs—a cause of panic in some sectors of the biomedical community—are countered. A call is made for more research into the global warming potential of U.S. food production systems** "to determine where the greatest reductions [in GWP] are to be found." **And the importance of understanding U.S. sediment movement and redistribution is discussed.**

Is It Warm? Is It Real? Or Just Low Spatial Frequency?

Leonardo da Vinci's portrait of the Mona Lisa is famous for her smile (Fig. 1). Perhaps it is the difference in her expression carried by high and low spatial frequency ranges (gradual versus sharp luminance gradations) that helps produce her smile's elusive quality.

The spatial resolution of the human visual system changes dramatically with distance from the center of gaze (*1*), due to the fact that both the retina and the visual cortex devote disproportionately more neuronal machinery to the fovea. Acuity 6 to 7° eccentric of the center of gaze is about one-tenth the acuity at the center of gaze. This means that our central vision is dominated by significantly higher spatial frequencies than is our peripheral vision. Conversely, vision only a few degrees from the center of gaze is much blurrier than in the fovea.

Fig. 1. Mona Lisa. Leonardo da Vinci. c. 1502. Oil on wood, 77 x 53 cm, Museé du Louvre, Paris.

To see how Mona Lisa's smile would look at different eccentricities, the image has been filtered to exaggerate selectively low or high spatial frequencies (Fig. 2). A clear smile is much more apparent in the low spatial frequency images than in the high spatial frequency image. Thus, if you look at the painting so that your gaze falls on the background or on Mona Lisa's hands, your perception of her mouth would be dominated by low spatial frequencies, so it would appear much more cheerful than when you look directly at her mouth.

This explanation goes beyond the popular idea that da Vinci blurred her mouth (*sfumato*) to make her expression ambiguous (*2*). It seems that her smile is more apparent in the low spatial frequency range, and therefore more apparent to peripheral vision than to central vision. Hence the elusive quality—you can't catch her smile by looking at her mouth. She smiles *until* you look at her mouth, and then it fades, like a dim star that disappears when you look directly at it.

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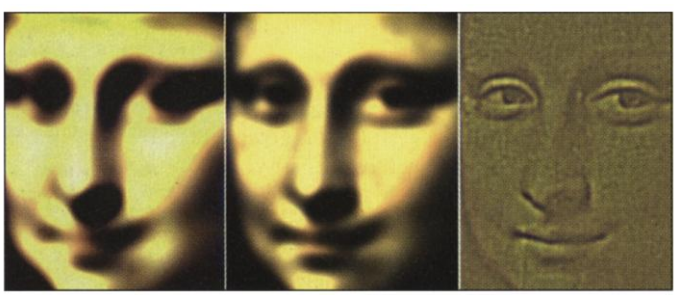

Fig. 2. Face of Mona Lisa, filtered to reveal very low spatial frequencies (left), low spatial frequencies (center), and high spatial frequencies (right). The two low spatial frequency images were generated by applying a Gaussian blur to the image and then enhancing the contrast; the high spatial frequency image was generated by applying a high-pass filter and then blurring slightly (Adobe Photoshop).

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Animal Welfare Act's Changes Deserve Praise, Not Panic

David Malakoff's recent News of the Week article "Researchers fight plan to regulate mice, birds" (6 Oct., p. 23; also see the related article "Research groups win delay in rules," 13 Oct., p. 243) covers the Alternatives Research & Development Foundation's settlement with the U.S. Department of Agriculture (USDA) to provide rats, mice, and birds legal protection under the regulations of the Animal Welfare Act. The article includes claims from biomedical trade associations that the "new rules will drive up animal-care costs, force small colleges to stop using live animals in classes, and spawn more lawsuits." Such exaggerations and other distortions by the National Association for Biomedical Research, the Association of American Colleges, and related organizations has created panic within some segments of the biomedical research community. In a recent editorial in *Nature* (*1*), it was noted that "some of the research lobby's arguments verge on the reactionary."

For most currently registered research facilities that have Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) and/or National Institutes of Health certification, the inclusion of rats, mice, and birds is already a reality and has been so for decades. For other facilities, legal protection for these species will only significantly affect facilities with substandard animal care and use programs. In the interests of better science and more humane animal care, such institutions should upgrade to the minimal standards that will be promulgated by the USDA rule-making procedures—standards that, because of existing interagency agreements, are unlikely to differ significantly from those already in existence for the care of rats, mice, and birds.

AAALAC and the American Association for Laboratory Animal Science (AALAS) both supported our efforts to include rats, mice, and birds under the regulations of the Animal Welfare Act. AALAS noted that "the political and economic rationale that led to the exclusion in the [Animal Welfare Act] of the vast majority of animals used in research is ethically indefensible." AAALAC went further by stating that "we can identify no philosophical or scientific reason for excluding these species from USDA regulatory oversight." These two strongly pro-animal research organizations would not have supported our efforts if a successful settlement were a danger to research insti-