Errata

We regret the following errors in *Presence* 1(1), Winter 1992.

1 On page 157, the information concerning the book edited by Steve Ellis should be modified as follows: MS 239-2 should be changed to MS 262-2; his phone number should be 415-604-6147; his correct E-mail address is silly@eos.arc.nasa.gov. Also, M. K. Kaiser and A. C. Grunwald served as section editors. The book is published by Taylor and Francis, London, 1991 (U.S. distributor: Taylor and Francis, Inc., 1900 Frost Road, Suite 101, Bristol, PA 19007).
2 On page 158, the telephone number for Telepresence Research should be 415-325-8951.
3 The Appendix to the piece by Tom Sheridan on page 126 should be replaced by the following:

Appendix: Linear Dynamical Analysis of Figure 5

A dynamical analysis of the linear model reveals the following:

$$F_m = (M_1s^2 + B_1s + K_1)x_m + (M_3s^2 + B_3s + K_3)x_e + F_e \quad \text{and} \quad (B_2s + K_2)(x_m - x_e) = (M_3s^2 + B_3s + K_3)x_e + F_e$$

Solving for x_e in the second equation and substituting for x_e in the first yields

$$F_m = (M_1s^2 + B_1s + K_1)x_m + Fe + \frac{[M_3B_2s^3 + (B_2B_3 + M_3K_2)s^2 + (B_2K_3 + B_3K_2)s + K_2K_3]x_m - (M_3s^2 + B_3s + K_3)F_e}{M_3s^2 + (B_2 + B_3)s + (K_2 + K_3)}$$

If all terms are finite this means the feeling of every environmental force component is modified by properties of the intermediate teleoperator mechanics and filtered through a damped oscillatory filter. For K_2 large (i.e., a rigidly connected master and slave),

$$F_m = [(M_1s^2 + B_1s + K_1)x_m + F_e + (M_3s^2 + B_3s + K_3)]x_m$$

and so the local and environmental damping and stiffness terms simply add. There is no way to distinguish slave from master forces in this case. For K_3 and B_3 both $= 0$ (i.e., the slave has no contact with the environment),

$$F_m = (M_1s^2 + B_1s + K_1)x_m + F_e + \frac{(M_3B_2s^3 + M_3K_2s^2)x_m - (M_3s^2)F_e}{M_3s^2 + B_2s + K_2}$$

In this case if $B_2 = 0$,

$$F_m = (M_1s^2 + B_1s + K_1)x_m + F_e + \frac{(M_3K_2s^2)x_m - (M_3s^2)F_e}{M_3s^2 + K_2}$$

which means environmental mass and connecting stiffness are felt in combination and through an undamped oscillation, and so too are the unbalanced forces. If for the no contact situation $K_2 = 0$,

$$F_m = (M_1s^2 + B_1s + K_1)x_m + F_e + \frac{(M_3B_2s^2)x_m - (M_3s)F_e}{M_3s + B_2}$$

which means environmental mass and damping are felt in combination and through a first order lag, and so too are the unbalanced forces.