

with an L.F.E. magnetometer, Model 101, and found to extend over a range of  $33.4 \pm 0.4$  gauss. This in no way affects the ratio of the nitrogen-to-proton coupling constants. The new value for the nitrogen coupling constant,  $An$ , is  $11.1 \pm 0.1$  gauss. Deuterium substitution in the molecule substantiates these values.

### Errata: Ion Exchange Kinetics. A Nonlinear Diffusion Problem

[J. Chem. Phys. 28, 418 (1958)]

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THE definition of  $\tau$  in Eq. (6), page 420, should read

$$\tau \equiv D_{At}/r_0^2.$$

The equation for the coefficient  $f_2(\alpha)$  in Eq. (21a), page 424, should read

$$1/f_2(\alpha) = 0.260 + 0.782\alpha.$$

### Errata: Theory of Helix-Coil Transitions in Polypeptides

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$X$  and  $x$  are the same quantity. Similar statements apply to  $z$  and  $Z$  and to  $j$  and  $J$ .  $\Gamma$  should be  $T$ , the absolute temperature. The quantity  $z \sum_{j=3} (j-2)n_j$  appearing at the end of the numerator of the third equation should read  $z^2 \sum_{j=3} (j-2)n_j$ . The quantity  $z^{(j-2)(1-\delta_{ij})}$  appearing in a similar location in the fourth equation should read  $z^{[(j-2)(1-\delta_{ij})-j]}$ . The  $\delta_{ij}$  appearing in the line following this fourth equation should read  $\delta_{1j}$ .

### Notes

#### Relation of Magnetic Disordering to the Thermodynamics of Solid Metallic Solutions

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THE face-centered solid solutions of iron-nickel at concentrations from 0 to 56 atomic percent Ni and at 1110°K have been shown<sup>1</sup> to exhibit essentially ideal thermodynamic behavior, within the accuracy of the measurements. That the excess entropy of solution (defined as the measured entropy of solution less that calculated for random mixing of species) is close

to zero over this range of composition means either that all contributions to the excess entropy algebraically add to zero, or that each such contribution is zero. The first possibility demands that at every concentration  $\Delta S(\text{vibration}) + \Delta S(\text{short-range order}) + \Delta s(\text{electronic}) + \Delta S(\text{magnetic}) = 0$ . Because this would be highly fortuitous, the second possibility seems much more likely, so that  $\Delta S(\text{magnetic}) \approx 0$ . Because at 1110°K the electron spins in each of these three phases are uncoupled, and assuming that the magnetic disordering entropy is adequately given by

$$R \sum_i x_i \ln(2s_i + 1),$$

where  $x_i$  is the fraction of atoms having spin  $s_i$ , a sufficient condition that the magnetic entropy of solution be close to zero is that the magnetic moments of the iron and nickel atoms are not changed through the solution process. Thus, the thermodynamic results enable a choice to be made between the two alternative interpretations of Shull's<sup>2</sup> neutron diffraction pattern from disordered fcc Fe-Ni solutions, in favor of the one showing a small variation of magnetic moments of Fe and Ni with composition.

The invariance of magnetic moment of a transition metal atom between the pure state and the dissolved state is not generally to be expected and is generally not observed.<sup>2</sup> Indeed, the variation of magnetic moment of an atom upon dissolution is a clear manifestation of the strong influence that environment may have upon the electronic structure of the atomic components in a solution. In general, then, an energy term may be expected for the electronic modification undergone by the atom in the solution process. Also, another energy term, as well as an entropy term, will arise from the magnetic disordering of either component and/or the solution (i.e., for any phase having coupled electronic spins at low temperature) between 0°K and the temperature at which the thermodynamic properties are measured. It would be suspected, for example, that a solid solution such as Au-Ni would have such energy and entropy terms as contributions to the thermodynamic functions. However, it should be noted that for the liquid Au-Ni alloy, regarded as formed from the liquid components, there will not exist energy and entropy terms for magnetic disordering. In such systems, therefore, one need not be surprised to find larger differences between the heat of formation,  $\Delta H_s$ , of the solid solution and the heat of formation,  $\Delta H_L$ , of the liquid solution than is usually the case for primary metallic solutions.<sup>3</sup>

The writer thanks Dr. I. S. Jacobs for a helpful conversation.

<sup>1</sup> R. A. Oriani, *Acta Met.* 1, 448 (1953).

<sup>2</sup> C. G. Shull, in *Theory of Alloy Phases*, Monograph (American Society for Metals, Cleveland, Ohio, 1956).

<sup>3</sup> R. A. Oriani, *National Physical Laboratory Symposium Proceedings (Teddington)* (to be published).