Schönhense and Heinzmann Respond: We agree with the first point of the Comment[1] on our Letter[2]: For the data presented a strong valence-orbital overlap of the neighboring rare-gas atoms was present because all spectra correspond to monolayer coverage (4.4 Å Xe-Xe spacing), as stated in the title. The coverage dependence of the resonance features turned out to be rather complicated, in particular when going via two, three, and several layers on to a rare-gas crystal. It was thus beyond the scope of our Letter but will be discussed in detail in a forthcoming publication.

In the submonolayer regime on Pt(111) and also on Ir(111) a well-defined commensurate $(\sqrt{3} \times \sqrt{3})R\,30°$ phase with sharp LEED spots occurs. Although the Xe-Xe spacing is 4.8 Å in this arrangement, i.e., the valence-orbital overlap is substantially smaller, the resonances are clearly present. They are shifted to the blue by about 150 meV and the splitting of the $6s$ line $(5p_{3/2} \rightarrow 6s_{1/2})$ is 30% smaller than for the close-packed arrangement. This compares favorably with our highly resolved photoemission spectra [cf. Figs. 1(a)–1(i) of Schönhense et al.[3]] where peak positions and splitting of the $p_{3/2}$ hole state show the same behavior.

The resonances were also observed at 0.3 monolayer where, according to our LEED patterns, $\sqrt{3}$ islands are present. No data exist for the limit of dilute coverage corresponding to isolated adatoms because this phase occurs on Pt(111) at much lower coverage,[4] below the detection limit of our technique.

Concerning a direct comparison of our data with those of Flynn and co-workers (Refs. 3 and 5–7 of the Comment) one important point must be mentioned: We found that all resonance features depend critically upon the quality of the single-crystal surface. Even small amounts of contamination (e.g., carbon traces) or surface imperfections after sputtering dramatically change the resonance features as well as the photoemission spectra. This effect has been extensively studied by Wandelt and co-workers[5] who made systematic investigations of the face specificity of Xe $5p$ binding energies, etc. Hence, from our point of view, a quantitative comparison with the optical experiments using polycrystalline substrates is, especially in the submonolayer regime, not possible. From LEED patterns it is evident that in both the $\sqrt{3}$ and the close-packed phase on (111) surfaces the symmetry is C_{6v}

with each adatom having six nearest neighbors. According to group theory, this reduction of symmetry lifts the $|m_j|$ degeneracy of the $p_{3/2}$ level, as has first been demonstrated by Horn, Scheffler, and Bradshaw.[6]

We do not agree with the second point of the Comment for the following reasons. In the energy region of the resonances, direct photoemission from Xe $5p$ is not possible; that process sets in at $h\nu = 9.3$ eV (on Pt).[3] Thus, the primary process in our experiment[2] is creation of a *locally neutral excited configuration* (cf. Fig. 1 of Ref. 2), identical to the phenomenon observed in optical absorption. The fact that this excitation was observed via a secondary Penning-type relaxation process is only a "technical" aspect in this context.

In conclusion, we would like to point out that only a very small fraction of the excited adatoms decay via the Penning channel. It is very likely that the main part indeed decays by transfer of the excited electron to the substrate conduction band as proposed by Flynn and co-workers. Nevertheless, it is just this small fraction of atoms taking the Penning channel which gives rise to the resonant electron emission presented in our Letter. This interpretation of the decay mechanism is strongly supported by the fact that the resonantly emitted electrons are almost completely spin polarized if the primary excitation is optically pumped by σ light.[2]

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[1]C. P. Flynn, preceding Comment [Phys. Rev. Lett. 57, 267 (1986).]

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[3]G. Schönhense, A. Eyers, U. Friess, F. Schäfers, and U. Heinzmann, Phys. Rev. Lett. 54, 547 (1985).

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