3*p*-orbitals to the 3*d*- and 4*s*-orbitals would show one remarkable feature, namely, the presence of relatively narrow bands corresponding to transitions to the $3d(e_g)$-orbitals[9]. Furthermore, in chromium, since the e_g-level is just about to fill up, we should expect the narrow band to lie at the absorption edge. In iron, on the other hand, two electrons are already in the e_g-orbitals so that a third would be forced to go in with antiparallel spin. It follows that the most stable empty orbitals are bonding orbitals, so that the narrow absorption band should be preceded by some absorption involving transitions to the conduction band. Both these anticipated features have been reported in the M_{II} and M_{III} spectra of chromium and iron[11], but no explanation of them has previously been given.

It is perhaps necessary to remark that the X-ray spectra give the relative positions of different unoccupied orbitals only in a qualitative sense. The excitation of an inner electron increases the effective charge on the nucleus and so perturbs the energy-level scheme of the metal. If different orbitals are perturbed to different extents, the relative positions of these orbitals may be modified. In particular, a localized orbital will be more affected than an orbital which is part of a broad band, so the stability of the e_g-orbital will be exaggerated somewhat in the X-ray spectrum. The difference between chromium and iron, however, is unambiguous.

Additional Data

There is not much to say about the later transition series. Neutron diffraction indicates no atomic magnetic moments for niobium, molybdenum or tungsten, suggesting the configurations b^5l^0, b^6l^0 and b^5l^0 respectively.

In the second and third series the last element to have the body-centred cubic structure is that in group VI[12]. In the first period, however, iron has both this structure and a close-packed structure[13]. Now body-centred cubic iron has a stabilization of about 9 kcal./mole due to the exchange energy between the two *l*-orbitals[1], there being no such exchange energy in close-packed iron. Since the two structures are almost equi-energetic[13] one must suppose that there is a compensating gain of bonding energy in the close-packed structure. Accepting this empirical balance, one then expects the body-centred cubic structure to be less stable relative to close-packed structures for ruthenium and osmium because one knows that the exchange integrals (from atomic spectral data) are smaller, and the overall cohesive energies (and hence presumably bonding energies in the limited sense) are larger. Although ruthenium and osmium are hexagonal close-packed, whereas iron is face-centred cubic, one may still suggest that the fact that only iron of the group VIII metals forms a body-centred cubic structure is due to the two reasons given.

In neither the hexagonal nor the cubic close-packed metal lattices is it possible to find any *s*-, *p*- or *d*-orbitals which do not interact in a σ-fashion with nearest neighbours. Hence our discussion does not apply directly to them. This means that the ferromagnetism of cobalt and nickel cannot be discussed in the same way as that of iron.

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ORIGIN OF TEKTITES

H. H. NININGER[1] has proposed that tektites be regarded as the ejecta from lunar craters produced by meteorite impact. He points to the work of L. J. Spencer[2,3] comparing the tektites with glassy matter from terrestrial meteorite craters. The wide distribution of tektites of a single type, such as australites, argues in favour of lunar rather than terrestrial craters.

This theory is especially attractive because there appears to be direct evidence that spherical glassy bodies have been ejected from some of the ray craters. The evidence is the fact that long bright streaks diverge from these craters; and that these streaks appear to return light in the direction from which it came in the manner of a beaded-glass screen[4]. (Prof. M. Minnaert has informed me verbally that experiments at Utrecht on various surfaces have shown that the dependence of brightness on phase angle observed for the bright rays cannot be duplicated by plausible sorts of surfaces; but can be duplicated by scattered glass beads.) Furthermore, in at least one case, namely, Tycho, the streaks extend almost half-way around the Moon, and hence correspond to velocities of the order of the velocity of escape from the Moon.

Nininger seeks to explain the distribution of tektite finds, chiefly within 40° of the equator, as a consequence of lunar origin, the tektites having followed, he believes, a direct line between the centres of the Moon and Earth, and arriving in the tropics because the Moon is overhead only in these latitudes. This explanation is not satisfactory, since it assumes implicitly that the orbital velocity of the Moon is perfectly cancelled by the explosion velocity. If the cancellation is imperfect, the orbital plane will be determined by the centre of the Earth and the resultant velocity vector, and will be oriented more or less at random.

This difficulty can be removed if we assume that the Earth possesses an outer atmosphere, extending 10 radii or more, and having a density of the order of 10^{-21} gm./cm.^{3}. (Dr. H.-K. Paetzold, of the Max-Planck-Institut, has verbally confirmed this order of magnitude of the density of the atmosphere at 10 Earth's radii.) In this case, many of the particles