is to be expected in view of the higher surface gravity which reduces the area covered by ejected material to about one-sixth of that on the Moon. Central peaks and peak rings are also present at smaller diameters, in accordance with calculated values, and in this respect Mercury shows a great resemblance to Mars, which has an almost identical surface gravity. Multi-ringed basins are also seen and the great Caloris basin closely resembles the lunar Mare Orientale both in structure and volume of material ejected.

Crater counts on the ejecta from this basin and on the lava flooding of the floor, as well as the other extensive areas on this hemisphere, imply that the materials of the mare-like smooth plains were erupted very shortly after its formation, which again suggests that the crustal heat persisted for rather longer than on the Moon. On the opposite side of the planet to the Caloris Basin is an area of very peculiar hilly and lined terrain the formation of which is difficult to explain. It could have been produced by seismic energy focused from the Caloris impact on the other side of the planet.

In summary, it may be said that the history of Mercury seems to have been very similar to that of the Moon, with crustal heating and one or more major episodes of impact cratering. Crater density counts indicate that Mercury, the Moon and Mars have all been affected by a similar meteoroid flux in the recent past, and as this is in accordance with the current terrestrial rate, we may assume that it has also applied to Venus.

Table 5·8 **Venus-Earth comparative data**

	Venus	Earth
equatorial diameter (km)	12 104	12 756
sidereal period of axial rotation	243·16d	$23_h\ 56_m\ 04_s$
inclination to orbit	178°	23° 27′
density (kg per m^3)	5 250	5 517
mass (Earth = 1)	0·815	1·0000
surface gravity (Earth = 1)	0·903	1·0000
escape velocity (km per s)	10·36	11·2
albedo	0·76	0·36

mean Sun-Venus distance 0·7233322 au

Venus

Despite the fact that Venus approaches closer to the Earth than any other major planet and that it is very similar in size and total mass to the Earth (Table 5·8), and the several Mariner, Venus Pioneer and Venera spacecraft missions, we know less about its surface features than those of any other body of the inner Solar System.

Venus has a very extensive atmosphere with the high albedo of 76 per cent, and this completely hides the surface. Even the rotation period could not be established with any confidence until 1962, when radar methods indicated a retrograde period of 243 days. This may be a result of tidal resonance with the Earth, as an axial rotation period of 243·16 days would result in the same side of the planet facing the Earth at each inferior conjunction. It is, however, difficult to establish how this can have occurred, unless Venus is asymmetrical like the Moon. The indistinct markings, sometimes visible from Earth and on the Mariner photographs, show an apparent 4-day rotation period for the upper atmosphere and this will be discussed later.

Interior and magnetism

The planet's overall density is fairly close to that of the Earth and it would be reasonable to assume that both planets had a similar composition when they were formed. The implication of this is that the core of Venus has a radius of about 3 100 km (Fig. 5·11) with a considerable (but unknown) proportion being fluid. There is expected to be a mantle and a crust which we may reasonably assume will fairly closely resemble those of the Earth. Despite the presumed fluid core, the planet has no detectable magnetic field, the axial rotation being apparently too slow to produce one.

Distinct problems have arisen since the discovery by spacecraft experiments that there are considerable anomalies in the abundances of certain gases, and of argon isotopes in particular. The amount of argon 40 (the product of radioactive decay of potassium) is much lower than on the Earth, being only about one third. Yet argon 36 and argon 38, the isotopes most likely to be present in any primordial nebula, are together 75 times as abundant as on Earth. In a similar manner the neon abundance is about 45 times as great. Other gases do not show this discrepancy;

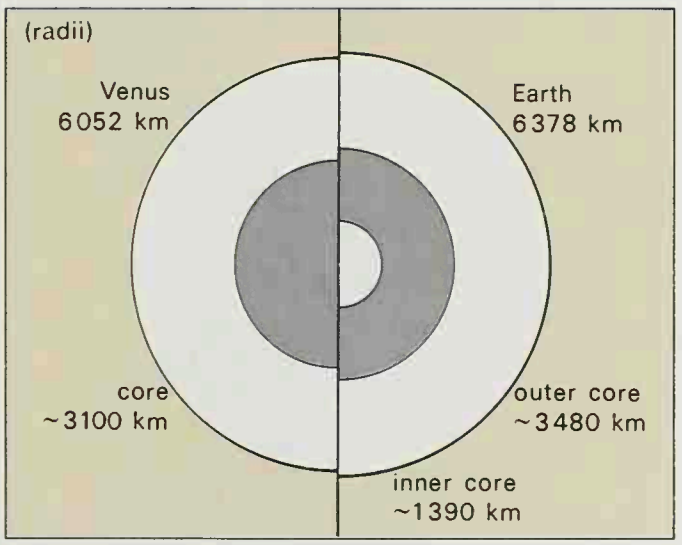

Fig. 5·11 Comparative sizes of Venus and the Earth. Venus may have a solid inner core like that of the Earth.

carbon dioxide, nitrogen and krypton are present at only about twice or three times their terrestrial levels. There is as yet no generally accepted theory to account for these differences, although various suggestions have been made. However, they do provide yet more information which can be used to obtain some idea of how the Solar System itself was

Surface features

The expected similarity of the interiors of the two planets would suggest that Venus should exhibit considerable tectonic movements and volcanism. However, for reasons to be discussed later, there is no free water on the surface or in the atmosphere,