Geology from space

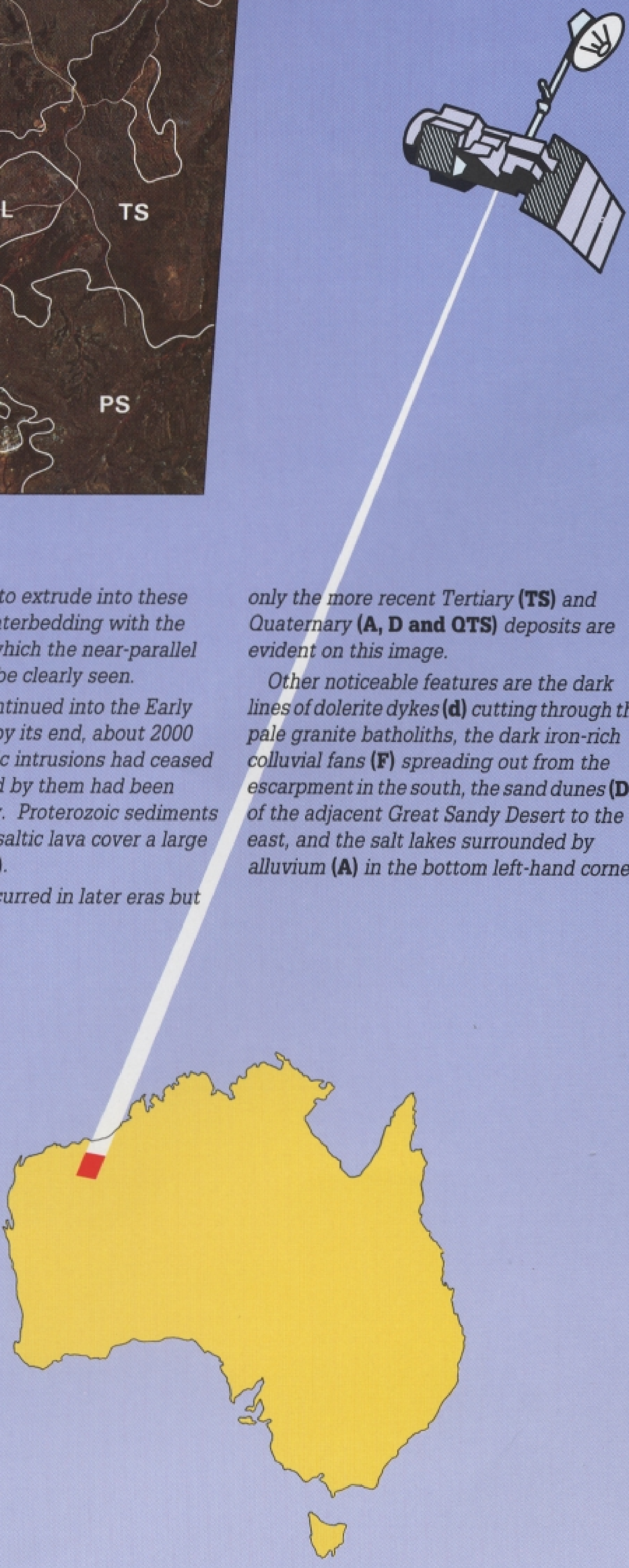
LEGEND

Cainozoic
- A — alluvium
- D — dunefield
- F — fans
- TS — Tertiary sediments
- QTS — Quaternary/Tertiary sediments

Proterozoic
- L — limestone
- PS — Proterozoic sediments

Archaean
- B — basalts
- G — granites
- AS — Archaean sediments
- SL — Archaean sediments and lava

d — dykes



Since 1932 when the first aerial photographs for geological purposes were taken in Australia, remotely sensed pictures which view the terrain have played a major role in the mapping and interpretation of Australian geology. The launch in 1972 of the Landsat series of satellites made available for the first time images which provide much additional geological information. The large area overview (186 x 186 km per scene) has allowed a better understanding of geological relationships on a regional scale, and in some instances the development of new concepts to explain them.

The interpretation overprinted on the image above shows some of the rocks and surface materials that can be readily distinguished. It is a good example of the wide variety of geological information that can be interpreted from satellite imagery.

This type of image is referred to as 'false-colour' since the colours do not correspond to those seen by the eye. Green colours on the ground are shown as blue, red colours as green, and infrared radiation (invisible to the eye) as red. The brightest infrared reflections come from healthy vegetation and therefore the large trees which line the watercourse in this semi-arid area show up as red on the image.

The Landsat image illustrated here covers part of the Pilbara region of Western Australia, around Marble Bar, and is one of the more spectacular pictures of large geological structures taken from space. It also shows that geological information is most clearly revealed in scenes covering arid and semi-arid areas, where there is usually little vegetation to mask the rock and soil.

The most notable features on this image are the lighter coloured areas of Archaean granite batholiths **(G)***—light coloured because of their high silica content. They represent the exposed cross-sections of large igneous intrusions which pushed up into the basalt layers that were being extruded on the floor of the Archaean sea some 3500 m.y. ago. Continuing until about 2850 m.y. ago these intrusions severely compressed and down-warped the basalt caught between them* **(B)***—dark coloured because of the low silica content of these mafic rocks—and heavily metamorphosed it into a hard 'greenstone' form.*

The igneous intrusions also forced the overlying rock up above sea level and the erosion products from these islands (the earliest parts of the Australian landmass) built up as sediments **(AS)** *on top of the basalts squeezed between them. Basaltic lava also continued to extrude into these surrounding seas, interbedding with the sediments* **(SL)***, in which the near-parallel bedding layers can be clearly seen.*

This sequence continued into the Early Proterozoic so that by its end, about 2000 m.y. ago, the granitic intrusions had ceased and the land created by them had been largely eroded away. Proterozoic sediments and interbedded basaltic lava cover a large part of this area **(PS)***.*

Sedimentation occurred in later eras but only the more recent Tertiary **(TS)** *and Quaternary* **(A, D and QTS)** *deposits are evident on this image.*

Other noticeable features are the dark lines of dolerite dykes **(d)** *cutting through the pale granite batholiths, the dark iron-rich colluvial fans* **(F)** *spreading out from the escarpment in the south, the sand dunes* **(D)** *of the adjacent Great Sandy Desert to the east, and the salt lakes surrounded by alluvium* **(A)** *in the bottom left-hand corner.*