We have determined abundances of 28 major, minor and trace elements in Apollo 17 deep drill cores 70007, 70008 and 70009 by 14 MeV and reactor thermal INAA. These cores were collected at the ALSEP site and form a part of the 107 cm upper coarse-grained interval of the 294.5 cm core. A total of 26 samples (≤1 mm) were analyzed to characterize 10 chemical units (CU) in cores 70007-70009. The uppermost section, 70009, comprised 25.1 cm of the core and was divided into 6 stratigraphic units (SU), based mostly on the grain size frequency variations and trends (1). We have chemically characterized this section of the core into 6 chemical units (Fig. 1). The boundaries between the chemical units and the stratigraphic units do not correspond directly. Our CU 1 includes SU VI, V, IV and part of SU III, as defined by Duke and Nagle (1). Since we were provided with only one sample from this upper 10 cm of the core, there is a possibility of more chemical units. However, track studies (2) show this portion of the core to be fairly uniform and no evidence for distinct units is found. The composition profiles (Fig. 2a and 2b) for this unit show a decreasing trend towards the base for the mafic mineral indicator elements. Felsic mineral indicator elements on the other hand show a general increase towards the base of this unit. CU 2 includes the lower portion of SU III and upper portion of SU II (Fig. 1). This unit is enriched in mafic minerals towards the base, as is evidenced by a sharp increase in Fe, Ti, Sc and Co and decreasing abundances of Ca and Al. CU 3 includes the lower half of SU II and part of the upper SU I. This unit shows a decreasing trend in Fe, Mg, Ti, Sc, Co and Ni towards the base, whereas Ca and Al show a slight increase. Our next 3 chemical units lie within SU I. Two of these units, CU 4 and CU 6 are very similar to each other and show a general decrease towards the base in the mafic mineral indicator elements. However, the middle of this region represented by CU 5 is an exception, with the highest Fe, Co and Ni contents in the entire 70007-70009 drill stem. The unusually high abundances of these elements in this unit seem to be related to a high abundance of meteoritic material. Many highly magnetic particles were observed in CU 5, but these have not been separately analyzed. A few fragments (≤1 mm) of anorthositic
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gabbro (?) and soil breccia are present in almost all 70009 samples. Minute shiny glass fragments, spherules and beads are ubiquitous. Samples from the upper portion of the core show an abundance of dark magnetic agglutinates.

Drill stem 70008 (Fig. 3) is described as coarse-grained and is believed to contain ejecta from the Camelot crater (1). This section of the core was also divided into 6 SU's (1). On the basis of chemistry, 3 CU's can be distinguished. The boundaries of our CU's correspond closely with the boundaries of the major SU's. At the top of this section our first chemical unit, CU 7, extends down to 23 cm and includes SU V and VI of Duke and Nagle (1). This unit has the highest abundances of Fe and Mg in 70008, well above the average Fe and Mg in 70009.

CU 9 includes the base of core 70008 and most of core section 70007, which is the third section from the top of the drill stem. It continues in core 70007 up to 35.5 cm. CU 9 shows a large gradual decrease in Fe, Ti and Mg towards the base of the unit. Fe and Ti abundances are in general among the lowest in the entire 70007-70009 drill stem, whereas Ca and Al abundances are among the highest in the drill stem and show a general increase towards the base.

Chondrite-normalized rare earth plots for core 70009 are shown in Fig. 4. It is evident that no clearcut distinction can be made between the different
units on this basis. All the CU’s in 70009 show a negative Eu anomaly as opposed to the case of core 60009 (3). Rare earth data for 70007 and 70008 are still being processed. In general, elements characteristic of mafic minerals are most abundant in the middle of the 70007-70009 drill stem, which is also the region with the lowest abundances of felsic mineral indicator elements. The lower region of section 70007 is clearly highly depleted in mafic mineral indicator elements, with respect to the entire 70007-70009 drill stem.

REFERENCES: