**THE ORGANIC COMPOSITION OF CARBONACEOUS CHONDRITES.** O. Botta[1] and M. A. Sephton[2], [1]Soft Matter/Astrobiology Laboratory, Leiden Institute of Chemistry, University of Leiden, 2300 RA Leiden, The Netherlands, [2]Planetary and Space Sciences Research Institute, Open University, Milton Keynes, MK7 6AA, UK

**Introduction:** The carbonaceous chondrite meteorites are fragments of asteroids that have remained relatively unprocessed since the formation of the solar system 4.55 billion years ago. These carbon-rich objects contain a variety of extraterrestrial organic molecules that constitute a record of abiotic chemical evolution that occurred prior to the origin of life on Earth [1,2]. Organic material can constitute up to 3 wt% of the meteorite; usually more than 80% of organic matter is insoluble in solvents.

Structural and stable isotopic characteristics suggest that a number of environments may have contributed to the organic inventory, including interstellar space, the solar nebula and the asteroidal meteorite parent body.

**Insoluble Organic Matter (macromolecular material):** In Murchison, the macromolecular material has an empirical formula $C_{100}H_{48}N_{1.8}O_{12}S_2$ based on pyrolytic release studies [3]. The macromolecular material is investigated by several techniques including solid state nuclear magnetic resonance (NMR) spectroscopy on demineralized meteorite samples [4,5] and analytical pyrolysis [6,7]. Analytical pyrolysis aided by the presence of water has revealed that the composition of macromolecular materials in different meteorites appears related to levels of parent body aqueous alteration [7], a process that also seems to be controlling the on the stable isotope composition of bulk carbonaceous chondrites [8].

**Soluble Organic Compounds:** A wide variety of organic compounds have been identified in several carbonaceous chondrite extracts [1,2]. The amino acid composition varies systematically with the carbonaceous chondrite type [9], with the CI containing only two major amino acids [10]. Enantiomeric excesses of non-biological amino acids have been detected in the two CMs Murchison and Murray with quantitative differences, raising questions about the origin of this feature [11]. The resent discovery of dihydroxyacetone and other sugar-related compounds in Murchison [12] has added another component to the inventory of biologically relevant compounds in carbonaceous chondrites.

**Summary:** The various studies on the organic matter in carbonaceous chondrites indicate that the major biogenic compounds can be delivered to the earth's surface in both simple and moderately complex organic forms. It is conceivable that on the primitive earth the delivery of these types of extraterrestrial molecules may have contributed to the building blocks from which life originated.

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