flavours is about $2 billion per year, representing nearly 12% by weight and 25% by value, of the world food additives market. Europe's cosmetics market is estimated at about $21 billion per year[10].

About 50 % of the total business is carried out by the 15 largest companies. Economies of scale of production and bulk buying are not significant. Of the 3,000 aroma chemicals currently produced, only 400 are made in quantities greater than 1 ton per year.

The number of naturally occurring compounds known to be important for aromas is at present about 5,000 and may ultimately rise to as many as 10,000. Most traditional agricultural resources cannot meet the current demand for naturally-derived fragrance and flavour materials. Important developments are taking place which will significantly improve production techniques within the decade. These include plant culture, synthetic biocatalysts, gas-phase reaction, multiphase reactor development, and the integration of product formation and recovery[11].

G. OTHER AREAS OF RESEARCH & TECHNOLOGY DEVELOPMENT

The development of new processes in the above areas will require major advances in ancillary fields. Process improvements in the biotechnological industries will ensure a higher product yield and purity per unit investment. Some additional research areas are discussed below:

1. BIOREACTORS

Bioreactor design, is an area of research whose results affect in a major way the economics and competitivity of a product or operation. These devices are invariably at the heart of production, and profitability is closely linked to efficient and cost-effective production processes. Continuous bioreactors achieve greater productivity and lower operating costs than batch operations. They are employed in the food, pharmaceutical, and waste water treatment industries, and to a limited extent in the chemical industry.

Bioreactor success is measured by productivity, reliability and operating costs, and are compared with batch reactors (fermenters). These are preferred over fluidized beds or other continuous bioreactor because are well characterized and standarized. A reluctance to innovate appears to be retarding continuous bioreactor development. Forecasts made in the early 80s estimated US sales of bioreactors at $270 million by 1989. Such forecasts have turned out to be over-optimistic[12]. In any event, the advantages of continuous reactors are so distinctive that many