Nature has always been a plentiful source of very simple to extremely complex structured molecules which play important roles in human dietary function as well as in the prevention of human disease. There are written evidences where the herbs and potions have extensively been used by ancient civilizations of the Chinese, Indians and North Africans for the treatment of various diseases.\(^1\) It was not until the mid-nineteenth century that the first serious efforts were made to isolate and purify the active principles of these remedies (i.e., the pure chemicals responsible for the medicinal properties). The success of these efforts led to the identification of many new chemical entities\(^2\) of therapeutic usage to such an extent that at present nearly 70% of all the drugs in the market are of natural product origin or derived from them.\(^3\) According to World Health Organization almost 80% of the people in developing countries of the world are committed to the traditional medicine for their primary health care, while it is well documented that about 75-80% of traditional medicine involves the use of plant extracts.\(^4\) This means that nearly 4 billion people in the world depend upon plants as a source of medicines.\(^5\) Still it is less than 10% of the world’s biodiversity that has been evaluated or used for potential biological activity, and many more useful natural lead compounds are still waiting for discovery with the challenge being how to be isolated and become a part of known natural chemical diversity. The sources of discovering natural product based drug like molecules include terrestrial


plants, terrestrial microorganisms, marine organisms, and terrestrial vertebrates and invertebrates.

![Figure 1.1. Natural sources for drug discovery.](image)

Although almost 100,000 plant products and approximately 20,000 microbial metabolites and have been described so far, but it’s a very small percentage of the total plants and micro-organism present on the Earth.\(^6\) Thus natural products will continue to serve the human mankind for several decades. However, a commonly encountered problem with natural products is their availability in very less quantities e.g. bryostatin (0.00014 %)\(^7\) and vincristine (0.2 %).\(^8\) Furthermore, as we all know natural products have evolved themselves over the time to interact with emerging new diseases and the increasing resistance to clinically used drugs, but still the increasing demand of new therapeutic agents possessing novel modes of action need the alternate of only isolating natural product. Thus the another aspect of drug discovery, in addition to isolating natural product is total synthesis or modification of isolated metabolites from nature and their structural modifications towards improved bioactivity e.g., in some cases they may possess all the required potency, selectivity and pharmacokinetic traits required to render it a clinically


useful drug agent e.g., taxol,\textsuperscript{9} rapamycin;\textsuperscript{10} in some other cases they offer a platform which needs to be optimized through modifications for therapeutic usage, e.g., halichondrin B after nearly 200 modifications/molecules led to the compound currently known as E7389 (eribulin), which is a novel tubulin inhibitor, approved by U.S. Food and Drug Administration in 2010 to treat patients with metastatic breast cancer.\textsuperscript{11} In some other cases, the pharmacophore may be transferred to an entirely novel structural setting, a classical example of which is Lipitor.\textsuperscript{12} Furthermore, to carry out synthesis or modification of these complex natural products, the development of newer methodologies are equally important, eventually helping in the design of new molecular probes with improved selectivity and potency also having stereochemically defined novel structural motifs, scaffolds and functionalities in easier and cost effective way.


\textsuperscript{12} Lea, A. P.; McTavish, D. \textit{Drugs} 1997, 53, 828.