INTRODUCTION
INTRODUCTION

Isolation and examination of Natural Products have drawn considerable attention of chemists from very early days. Many valuable products were obtained from the natural wealth and used for innumerable purposes in the past for human welfare and various other activities. Hence, the development of chemical studies in the 18th and 19th centuries was inevitably deeply associated with increasingly more sophisticated probing into the nature of the traditional and the new substances. The latter half of the 19th century saw the rapid evolution of organic structural theory closely tied to the structural challenges presented by these natural constituents, mostly from plant sources. Progress regarding the synthetic methods was also made gradually along with the studies of organic compounds. Although the natural products have been obtained mostly from plant sources, still only a meagre percentage of the plant world has been explored for its chemical constituents, particularly in India where there is abundance of wide variety of vegetation since this country possesses different types of climatic conditions and soil etc.
The classes of organic compounds generally associated with the term 'Natural Products' include mainly alkaloids, carbohydrates, fats, fatty acids, proteins, steroids, terpenoids, essential oils, carotenoids, vitamins, glycosides and numerous derivatives of heterocycles (e.g. flavonoids and coumarins etc.).

The common procedure for obtaining natural products (especially from plants) involves extraction of the dry and powdered raw material with a suitable solvent and then treatment of the extract in various ways to obtain different compounds in pure form. The use of ion-exchange, counter-current-distribution, and the various types of chromatographic methods has now enabled the separation of a large number of compounds more easily in pure form from crude extracts and thus made it possible to isolate and characterise 25-50 different natural compounds from a single plant species that might have yielded only a few in the early days. This, of course, implies that many species may be available for re-examination by modern methods and techniques.

The first problem posed by a natural compound, after its isolation in pure form, is the characterisation and elucidation of its structure. In a rough way the classical approach may be divided into 4-phases: (i) elemental analysis, determination of its molecular formula and functional groups; (ii) determination of the carbon skeleton and the location of the various groups; (iii) clarification of the stereochemistry;
and (iv) synthesis of the molecule. Historically, the oldest procedure involves the chemical degradation of a compound, besides study of its physico-chemical properties, synthesis of the simpler units obtained by degradation and reconstruction of the original molecule by inference. The next major step is the recognition of families of like structures now understood to be the result of common biogenetic pathways.

The most important modern development in the field of structural analysis has been the extensive use of physical measurements. Such observations carry the dual advantages of detecting unexpected changes in a molecule on chemical activation, and of requiring minute quantities of the material.

The development of electronic spectroscopy (U.V. and visible) helped the detection of certain chromophores, especially the carbonyl groups and the conjugated systems. The use of infra-red spectroscopy (and Raman Spectroscopy) afforded clear indications of the presence or absence of a wide variety of functional groups etc. Recently, the growth of nuclear magnetic resonance (and electron paramagnetic resonance etc.) spectroscopy with its unique and valuable property of discerning the environments and the number of different protons in a molecule has played an important role. Thus, various functional groups (and their environments) may be identified through a variety of chemical as well as physical means. The development of a number
of modern reagents, both mild and specific for certain functionalities, besides the classical ones, has made functional group identification much more versatile.

The next step, and the most difficult one, is the discernment of the molecular skeleton. Two kinds of degradative tools have been used for the purpose. In the first type the molecule is simplified by suitable chemical reaction(s) to a closely related stable-aromatic skeleton. Secondly, the molecule is cleaved into smaller fragments, each one much simpler and separately identifiable by different methods.

Once the skeleton and its functional groups are assigned there remains the problem of stereochemistry of the molecule since many natural products may have a number of asymmetric centres and are generally optically active.

The stereochemical aspects of a compound are studied in a suitable manner on the basis of conformational analysis and different chemical changes. The shape of the molecule is also demonstrated for instance, either by isolation of a degradative fragment with an asymmetric centre intact and its inter-relationship with a known asymmetric compound via a sequence of chemical interconversions, or by interpretation of an optical rotatory dispersion curve of a suitable derivative (e.g. ketone).
In short, the application of mass-spectra and X-ray analysis, the optical rotatory dispersion and circular dichroism measurements, the molecular rotation relationships, principles of conformational analysis, the theoretical understanding of the different reactions and the reaction mechanism, introduction of new reagents and photochemical processes, improved methods of fractional distillation and aromatisation by dehydrogenation, development of new reactions and synthetic routes, the knowledge of enzymic processes, and the tracers technique etc., besides the improved methods of isolation and separation and the above mentioned procedures, have greatly facilitated and stepped up the study of natural products of an even more complex nature.

In addition to the structural determination of the newly discovered natural compounds, efforts are also, sometimes, made for their synthesis, and understanding about their formation in nature and for tracing of biosynthetic pathways. Explorations into the new areas of chemotaxonomy and phytochemical processes may also be carried out.