A survey of excavation of Nagarjun Sagar Dam Project site, Hyderabad, India reveals that people got copper pollution into their skeletal system on account of having peculiar disease which is technically called "Knee-Knock" i.e. bulging out knees to that extent so that they rub together while walking causing a lot of inconvenience and hence the present work has been undertaken.

Calcium hydroxylapatite, Ca$_{10}$(PO$_4$)$_6$(OH)$_2$ is the primary crystalline inorganic component of human skeletal system amounting to about 40 per cent by weight. It is isomorphous with the naturally occurring mineral known as fluorapatite, Ca$_{10}$(PO$_4$)$_6$F$_2$. It undergoes a series of cationic and anionic exchange reactions which are of biological and physico-chemical significance. The OH$^-$→F$^-$ substitution functions as the basis for the prophylactic action of fluorine in the occurrence of dental caries.

Ca$^{2+}$ can isomorphously be substituted by Sr$^{2+}$ or Ba$^{2+}$ or Cd$^{2+}$ or Cu$^{2+}$ which explains the mechanism of their incorporation into the human skeletal system. It is evident that when Ca$^{2+}$ is completely replaced by Cu$^{2+}$, results in the formation of copper hydroxylapatite, Cu$_{10}$(PO$_4$)$_6$(OH)$_2$, partial or incomplete replacement results in the formation of solid solutions of calcium and copper hydroxylapatites. Although such solid solutions were reported to have been
solid solutions only due to limited availability of instruments for such investigations; however, solubility equilibria is studied with all the samples prepared.

The thesis has been divided into two sections. Section I is a judicious compilation of information about hydroxylapatite available in diverse branches of research. The physico-chemical aspects have naturally been given emphasis. The experimental work carried out by the author has been included in Section II which has been presented in the conventional pattern of a research publication.

A consolidated list of books and journals consulted has been included at the end of the thesis to facilitate easy reference. References pertaining to each section have not been separately listed under the section to avoid duplication. The journals have been abbreviated on the pattern followed by "Chemical Titles". In the appendix are included the research publications made during the progress of the work reported in the thesis.

I express my indebtedness to Dr. S.V. Chiranjeevi Rao, M.Sc. (Andhra), Ph.D. (Sambalpur), F.I.C.S., ex-Lecturer in Chemistry, G.M. College, Sambalpur now research Chemist Hindustan Zinc Limited, Visakhapatnam-15, Andhra Pradesh for supervision of the dissertation at all stages of encouragement.
I am grateful to Prof. Dr. G. Ferrari, Professor of Crystallography, University of Torino, ITALY, for X-ray diffraction spectra, Prof. Dr. R.A. Condrate, Associate Professor of Spectroscopy, New York State College of Ceramics, Alfred University, NEW YORK, for Electronmicrographs.

Dr. M.M. Dhar, F.R.A., Deputy Director, Central Drugs Research Institute, Lucknow for Infrared Spectra, Director, Regional Research Laboratory, Bhubaneswar for TGA, DTA and DTG analysis. Prof. Dr. L.K. Tripathy, Professor and Head of the Department of Anatomy, V.S.S. Medical College, Burla for supply of adult human bone, Prof. P.C. Brahma, Ex-Professor and Head of the Department of Chemistry for providing the necessary facilities to carry out this piece of research work in the Department of Chemistry, G.M. College, Prof. Dr. K.S.R. Murty, Principal, G.M. College, Sambalpur for his constant encouragement.

Mr. Balaram Manda, Lecturer in Zoology, G.M. College, Sambalpur for his continuous help during the course of work and Mr. Debadatta Panda, M.Sc. (Physics) for the Photographs. The author also gratefully acknowledge with thanks to the authorities of University Grants Commission, India and Sambalpur University for financial assistance. I am also thankful to Mr. M.M.C. Pillai for typing the dissertation at the quickest possible time.
Finally I thank my wife Mrs. Shanti Patel, Lecturer in Zoology, Women's College, Sambalpur for her constant encouragement and assistance without which I could have not done and incorporated this work in the form of a Ph.D. degree Thesis of Sambalpur University.

Department of Chemistry,
Gangadhar Meher College,
Sambalpur.

( REMANANDA PATEL )