<u>A B S T R A C T</u>.

The thesis embodies the results of detailed investigations on structure and petrology of Precambrian granitic rocks and associated metamorphites of Satpura orogeny, occurring around Jamua-Kakwara-Bhitia(between Lat. 24°48' and 25°0' N; Long. 86°42' and 86°55' E included in Survey of India toposheet No. 72 L/9 and 72 L/13), in the Bhagalpur district of Bihar State, India.

An attempt has been made in the present work to outline the structural and petrological evolution of the metamorphites and the gneisses, with imprints of deformation and metasomatic replacement leading to <u>in-situ</u> granitization.

The polymetamorphic sequence includes quartzites, mica schists, calc-silicates, ortho-amphibolites, migmatites and granite gneisses with pegmatite, aplite and quartz veins.

Diastrophic structures imprinted on the rocks indicate the presence of a series of buckled and flattened modified parallel or near similar folds of diverging trend and plunge. Structural analyses reveal a complex monoclinic squeezing along NW-SE initiating overturned isoclinal high plunging folds (F_1) with southerly dipping NE-SW axial planes (S_2) ; superposed with a probable time gap by steeply plunging disharmonic folds of second generation (F_2) with sub-vertical axial planes (S_3) trending NNW-SSE. Statistical analyses of deformed pebbles contained in a thin conglomeratic horizon in the north-eastern part of the area, provide convincing evidences for superposed deformation leading to existing structural diversities.

Mylonitization while reflecting a tectonic slide, demarcates the waning phase of F_2 deformation as indicated by the bending of garnet porphyroblasts of late F_1 origin and development of mylonitic lamination in the comminuted mylonite-gneisses with F_2 deformational structures. Conjugate folds and kink bands with kink planes (S_4) striking SE-NW, interset the crenulation cleavage (S_3) locally in mica schists at angles between $10^{\circ}-30^{\circ}$ identifying a weak impulse of less pervasive deformation (F_3) . Kinking in feldspar porphyroclasts of mylonitic origin and the significant development of intrafolial folds in blasto-mylonites post-date the F_3 movements in relation to F_2 .

The regional metamorphism (sillimanite-muscovite sub-facies of almandine-amphibolite facies) was initially progressive in the sense, that the chlorite and micas defining the axial plane schistosity (S_2) developed in the early stages of F_1 folding, in contrast to the garnet porphyroblasts of later origin, with schistosity S_2 abutting against the mineral grains. Sillimanite is pre-kinematic in relation to F_2 and its appearance signifies a thermal peak of metamorphism which initiated a possible metatexis locally, developing mobilized migmatites.

The regional granitization might have been chiefly responsible for effecting retrograde changes in rocks. The reversion of sillimanite to muscovite, diopside or augite to amphibole, garnet or biotite to chlorite, preserved characteristically in the mylonites indicate an unequivocal link of retrogression with mylonitization.

Detailed petrographic study of the various rock types suggests, a large scale modification of the pattern of regional metamorphism by migration and fixation of elements leading to <u>in-situ</u> granitization. The migmatites represent an intermediate stage of granitization of preexisting metamorphites with relicts of resistant amphibolites remaining as unabsorbed paleosomes.

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The study of geochemical variations based on modal and soda-potash analyses of representative samples reveal, that granitization is chiefly due to alkali metasomatism (soda followed by potash).

Trace element analyses of metabasites (ortho-amphibolites) and migmatites point to a rise in the concentration of Sr, Ba, Pb, Ga and Y in the rocks with progressive granitization, in contrast to Sc, Ni, and Cr which record a decrease. Granitization has little or no effect on the distribution of Co and Cu in the rocks of the present area.

Pegmatites and quartz veins show, that they owe their origin to metasomatic replacement and are indicators of granitization in phases.

Statistical and morphological study of sub-rounded zircons and sub-pyramidal authigenic tourmaline (both showing overgrowth and outgrowth) occurring respectively in the gneisses and the metamorphites, suggests a sedimentary parentage of the metamorphites overlying Kolhans.