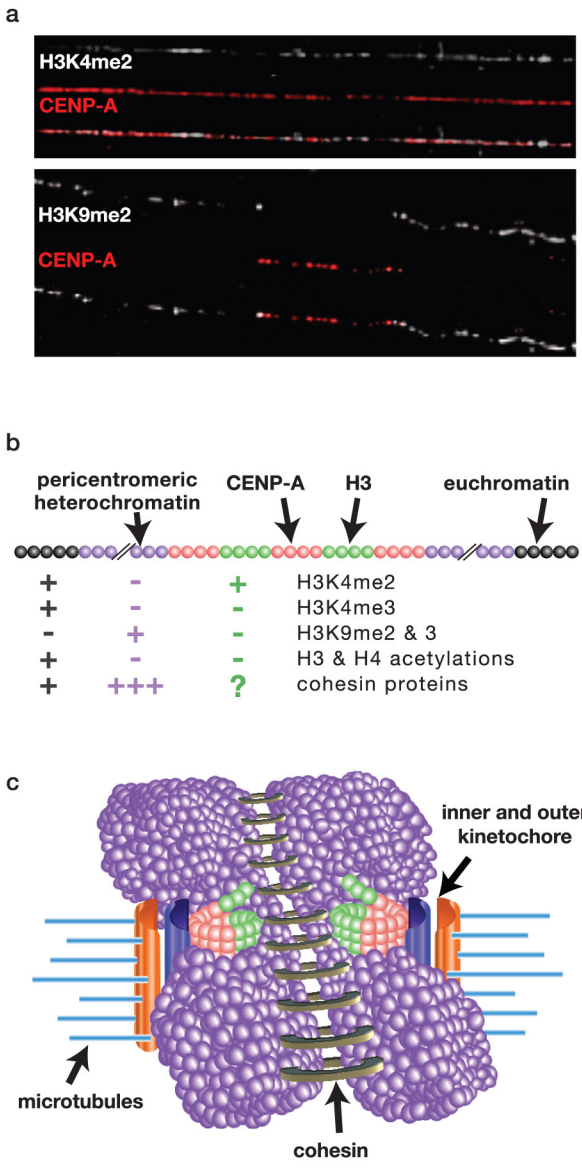

Figure 7. Distinct Patterns of Histone Modifications in Centromeric Chromatin

(*a*) Immunofluorescence using antibodies that recognize specific histone modifications on extended chromosome fibers showed that the interspersed H3-containing nucleosome blocks have a pattern of modifications that are distinct from canonical euchromatin and heterochromatin (Sullivan and Karpen 2004). For example, despite the fact that centromeres in most eukaryotes are embedded in large blocks of pericentric heterochromatin, the interspersed H3 blocks contain the H3K4me2 modification normally associated with "open" euchromatin (*top*), and lacks the heterochromatin marker H3K9me2 present in the pericentric flanking regions (*bottom*). (*b*) Summary of "2D" organization of centromeric chromatin in interphase based on extended chromatin fiber studies in flies and humans. + and – indicate the presence and absence of the indicated histone modification (respectively) in euchromatin, pericentromeric heterochromatin, and the interspersed blocks of H3 nucleosomes in centromeric chromatin (Sullivan and Karpen 2004; Lam et al. 2006). (*c*) Model for the 3D organization of chromatin in the centromere region of mitotic chromosomes. Associations between similarly modified nucleosomes are proposed to contribute to the formation of distinct 3D structures in centromeric and flanking chromatin. Interspersed CENP-A/CID and distinctly modified H3 and H4 may mediate formation of the "cylindrical" 3D structures observed in metaphase chromosomes (Blower et al. 2002; Sullivan and Karpen 2004). H3K9me2 chromatin, which recruits heterochromatin proteins such as HP1, and cohesion proteins such as RAD21/SCC1, is present in the inner kinetochore space between mitotic sister chromatids and in regions that flank centromeric chromatin. This arrangement may be necessary to "present" CENP-A toward the poleward face of the mitotic chromosome and facilitate recruitment of outer kinetochore proteins, and to promote HP1 self-interaction and proper chromosome condensation/cohesion. Cohesins are presented as ringed structures, in accord with recent models.