Stem cell mitotic drive ensures asymmetric epigenetic inheritance

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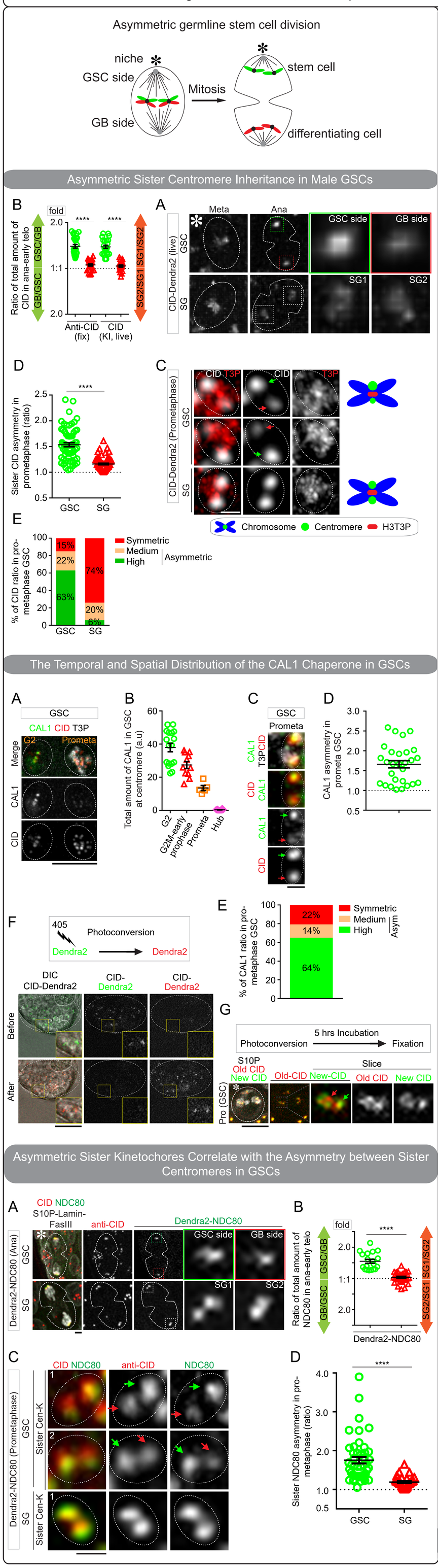
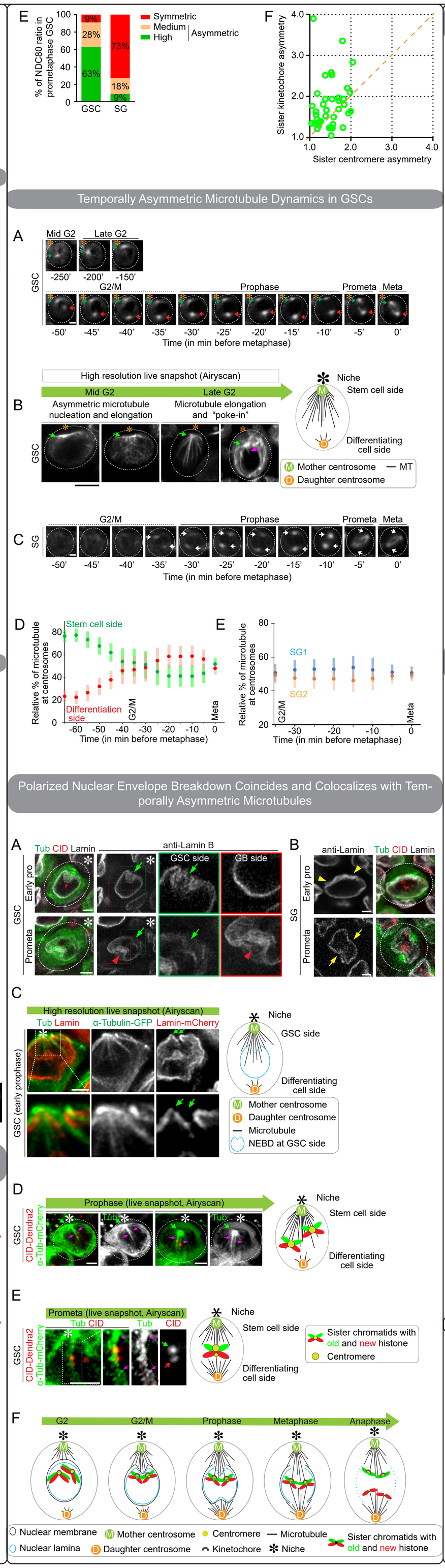
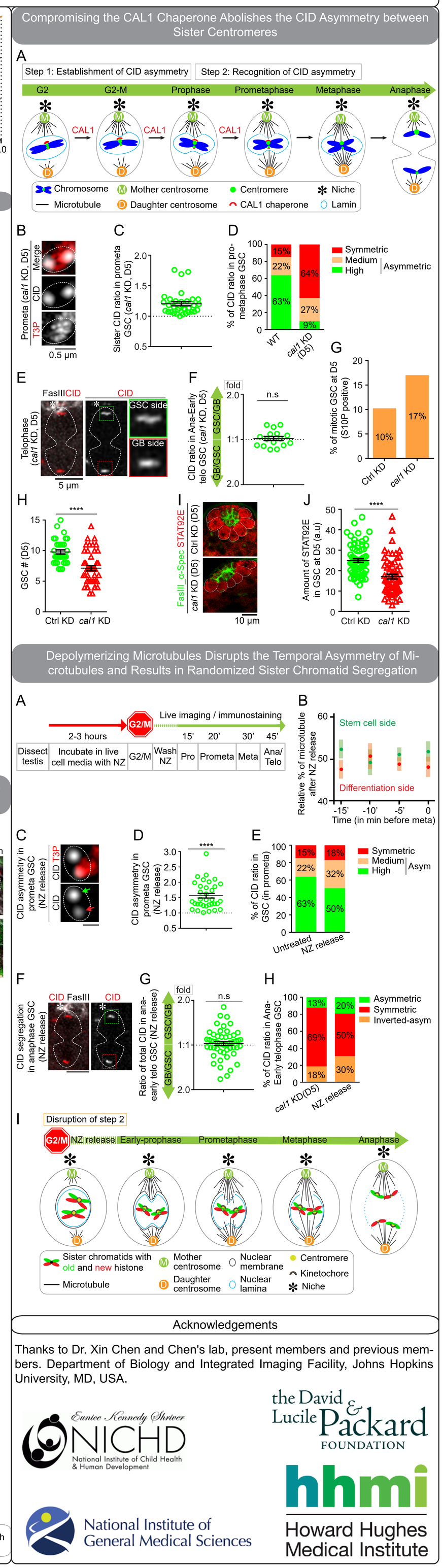
Many stem cells utilize asymmetric cell division (ACD) to produce a self-renewed stem cell and a differentiating daughter cell. How non-genic information could be inherited differentially to establish distinct cell fates is not well understood. Here, we report a series of spatiotemporally regulated asymmetric components, which ensure biased sister chromatid attachment and segregation during ACD of Drosophila male germline stem cells (GSCs). First, sister centromeres are differentially enriched with proteins involved in centromere specification and kinetochore function. Second, temporally asymmetric microtubule activities and polarized nuclear envelope breakdown allow for the preferential recognition and attachment of microtubules to asymmetric sister kinetochores and sister centromeres. Abolishment of either the asymmetric sister centromeres or the asymmetric microtubule activities results in randomized sister chromatid segregation. Together, these results provide the cellular basis for partitioning epigenetically distinct sister chromatids during stem cell ACDs, which opens new directions to study these mechanisms in other biological contexts.







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