平成 26 年 4 月 22 日

（独）理化学研究所
研究担当理事　川合 眞紀

## 平成 25 年度実施 主任研究員の中間レビューの結果について

主任研究員制度設置規程(平成 25 年規程第 13 号)第 5 条に基づき主任研究員の中間レビューを実施し、評価結果は下記のとおりです。

### １．評価対象：平野染色体ダイナミクス研究室 平野 達也 主任研究員

### １）評価体制

実施日：平成 26 年 1 月 6 日（月曜日）
4名の所外有識者を評価委員とするヒアリングレビューを実施(内1名は急遽メールレビューにて評価を実施)。

評価者：

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### ２）評価結果の概要等

*General comments: (arranged in random order)*

【Reviewer 1】

In every cell cycle, chromatin dynamically changes its morphology from relaxed from to well-organized condensed form at the transition between interphase and mitotic phase. The mechanism of this essential process for achieving accurate chromosome segregation has not yet been determined. Dr. Tatsuya Hirano has been a pioneer and leading scientist in this field, which is evident from his publication in the past eight years and ongoing research projects. Dr. Hirano and his lab members addressed the precise functions and regulatory mechanisms of condensin complexes by using appropriate model organisms and *in vitro* systems. For example, they showed that condensin I and II contributes lateral and axial compaction of the mitotic chromosomes, respectively, and that

the difference in relative ratio of condensing I and II defines the different chromosome morphology between embryonic and somatic cells. Their findings revealed the general as well as tissue- or organism-specific functions of condensins and their related complex cohesin. Many of the published and ongoing studies are conducted by young researchers (postdoctoral fellows and staff scientists) through a wide range of collaborations, showing promising research activities and contributions to scientific community for the future.

【Reviewer 2】

Dr. Tatsuya Hirano has established his reputation in chromosome biology in the US by discovering and characterizing condensin, the protein complex involved in chromosome condensation. Since he joined RIKEN from the Cold Spring Harbor Laboratory in 2006, he has continued to study condensin and molecular mechanisms of chromosome assembly and segregation. During this period, he has published several excellent papers, mostly about condensin. It is impressive that he focuses persistently on studying condensin, and this is important because he has to establish the pioneer position in this field. Accordingly, co-workers in his laboratory turn in the same direction and are harmonized. Therefore, I think that the laboratory is well organized.

【Reviewer 3】

Tatsuya Hirano is a world leader at studying the composition and assembly of mitotic chromosomes. He is most famous for his discovery of the condensin complex (which he later showed to be two related complexes: condensin I and II), but he has also made significant contributions to understanding the cohesin complex and its regulation. Studies in his lab now focus primarily on understanding the mechanism of action of the condensin complex, trying to understand the differing functions of the condensin I and II complexes, and exploring the functions of condensin during interphase (particularly during DNA replication), in brain development and in meiosis. His mechanistic and structural studies are also taking advantage of the experimental accessibility of bacterial SMC complexes, and he has recently published a crystal structure from this work. He appears to have decided to wind down his studies of cohesin and its regulation. Perhaps his most daring ongoing project is based on his hypothesis that a very few proteins are required to assemble mitotic chromosomes. He is therefore attempting to assemble chromosomes in vitro from purified components. He has an excellent team at RIKEN, with four established staff scientists and two postdoctoral fellows. These lab members have been very productive, and he has published 21 papers since moving to RIKEN in 2006. I find Dr. Hirano's proposed future experiments to be exciting, but the goals are very challenging. It may take quite some time to figure out exactly what condensin I and II are doing, and focusing on a specific problem like that can sometimes limit lab productivity. It is too early for me to judge the quality of the mouse work from his group, but this represents an exciting new direction for him, and with his rigorous thinking and excellent biochemical skills this may yield important new results. The crystallography of bacterial

SMC proteins is also an exciting new direction, and despite competition from other groups, I expect that he will make important contributions. I believe that the most exciting – but also most risky – project is the attempt to assemble mitotic chromosomes from purified subunits. No one can say whether this will work, so it is a classic example of a high risk/high gain project. If it does work, this will be a real breakthrough for the chromosome structure field. I believe that this world-leading lab is on course to continue to make important contributions. My main suggestions would be that the lab should invest more in further developing their abilities to do high resolution (possibly super-resolution) microscopy, and that they should consider expanding their intellectual and technical expertise by establishing more external collaborations.

【Reviewer 4】

**Research objectives:**

Dr. Hirano originally identified a protein complex called condensin (Hirano and Mitchison, *Cell*, 1997). Since then, he has consistently focused his research on condensin and a related protein complex, cohesin, and has been one of the leading scientists in the field. His research objective is to understand the molecular mechanisms underlying the chromosome segregation and condensation in mitosis and meiosis.

**Research results:**

Dr. Hirano and his group have extensively studied the functions of condensins 1 and 2, two related protein complexes of the condensin family. Specifically, they have characterized the distinct roles of the two complexes in chromosome condensation, and condensin 2's novel function in replication-related events in S phase. In addition, they have extended their study onto evolutional and atomic level approaches.

**Management of the Laboratory:**

Dr. Hirano hired seven post-doctoral fellows, and five of them successfully took new positions after leaving the laboratory. He has worked with four staff scientists. They contribute to different aspects of the laboratory's projects, which consolidate the strength of the research group. In sum, Dr. Hirano has shown a strong ability of laboratory management.

**Future research plans:**

The research group keeps focusing on cohesin and condensin complexes, and is extending their research approaches, such as in vivo analyses using knockout mice and mechanistic studies based on X ray crystallography and in vitro reconstitution analyses.

**Overall assessment:**

Dr. Hirano's group is one of the globally renowned research teams in the field. Having a relative small group size, they should carefully select feasible and productive research directions in the future.

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