



- 2022.04 제40권 제1호
- Bulletin of the Korean Physical Society
- 한국물리학회 회보

# 2022년 봄 학술논문발표회 및 임시총회

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2022 KPS Spring Meeting

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2022년 4월 20일(수) ~ 22일(금)  
Virtual Conference

**B11.03** [14:48 - 15:12]

**Fe<sub>3</sub>GeTe<sub>2</sub> : A site-differentiated Hund metal / HAN Myung Joon<sup>\*1</sup>** (<sup>1</sup>Department of Physics, KAIST)

**B11.04** [15:12 - 15:36]

**Coherent magnetic exciton in Ni-based van der Waals magnets / KIM Beom Hyun<sup>\*1</sup>** (<sup>1</sup>School of Computational Sciences, KIAS)

**[B12-ap] [F] Organic Material Properties and Device Application**

2022. 04. 20 Wednesday 14:00~15:36

Room: 12

좌장 : 이태우 서울대학교

Chair: LEE Tae-Woo (Seoul National University)

**B12.01** [14:00 - 14:24]

**Organic/inorganic hybrid light emitting transistors for backplane/driver-free display applications / SEO Jung Hwa<sup>\*1</sup>** (<sup>1</sup>Physics, University of Seoul)

**B12.02** [14:24 - 14:48]

**Ferroelectric Organic Artificial Synapses for Neuromorphic Electronics / WANG Gu-nuk<sup>\*1</sup>** (<sup>1</sup>KU-KIST Graduate School of Converging Science and Technology, Korea University)

**B12.03** [14:48 - 15:12]

**A study of defect control for high performance perovskite LEDs / LEE Bo Ram<sup>\*1</sup>** (<sup>1</sup>Physics, Pukyong National University)

**B12.04** [15:12 - 15:36]

**Resistive switching behaviour in metal-halide perovskite unipolar memory devices probed by current noise spectra / KANG Keehoon<sup>\*1</sup>, AHN Heebeom<sup>2</sup>, LEE Takhee<sup>2</sup>** (<sup>1</sup>Materials Science and Engineering, Seoul National University, <sup>2</sup>Department of Physics & Astronomy, Seoul National University)

**[B13-st] Complex Systems I**

2022. 04. 20 Wednesday 14:00~15:48

Room: 13

좌장 : 백승기 부경대학교

Chair: BAEK Seung Ki (Pukyong National University)

**B13.01** [14:00 - 14:24]

**The dynamics of faculty hiring networks / LEE Eun<sup>\*1</sup>, CLAUSET Aaron<sup>2</sup>, LARREMORE Daniel<sup>2</sup>** (<sup>1</sup>Pukyong National University, <sup>2</sup>University of Colorado Boulder, USA)

# Effect of The Adult-Born Immature Granule Cells on The Winner-Take-All Competition in The Hippocampal Dentate Gyrus

학술대회 명 2022 KPS Spring Meeting | 접수일 2022-02-14

발표분야 Statistical Physics | 서브발표분야 Complex Systems

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Presentation materials There is no data.

## Abstract:

Adult neurogenesis occurs in the hippocampal dentate gyrus (DG) throughout life. Thus, young immature granule cells (imGCs) appear in adulthood. In comparison to mature GCs (mGCs) (born during development), young adult-born imGCs exhibit two competing distinct properties such as high excitability (causing high activation) and low excitatory innervation (reducing activation). We develop a spiking neural network for the DG, incorporating the imGCs, and investigate their effect on the winner-take-all (WTA) competition. When considering the high excitability of imGCs, the imGCs become very highly active, while the mGCs exhibit very sparse firing activity because of strongly increased feedback inhibition from the BCs and the HIPP cells (caused by the high activation of the imGCs). Thus, the whole population of all the GCs become a very heterogeneous one, composed of a (major) subpopulation of mGCs (exhibiting strengthened WTA competition) and a (minor) subpopulation of imGCs (showing weakened WTA competition). Next, we consider the low excitatory innervation of the imGCs (resulting in sparse firing), which could counteract the effect of high excitability. As excitatory innervation of the imGCs is decreased, the activation degree of the imGCs decreased so rapidly (i.e., their WTA competition increased), while the activation degree of the mGCs increased (i.e., their WTA competition decreased). As the effect of the imGCs is decreased, the heterogeneity degree in the whole population became reduced.

## Keywords:

Hippocampal dentate gyrus, Winner-take-all competition, Adult neurogenesis, Immature granule cells (GCs), Mature GCs