Applied Microscopy
Korean Society of Microscopy
pISSN 2287-5123 · eISSN 2287-4445
https://doi.org/10.9729/AM.2017.47.4.251

Novus Imago

The First Transmission Electron Microscope Image Imagined by Artificial Intelligence

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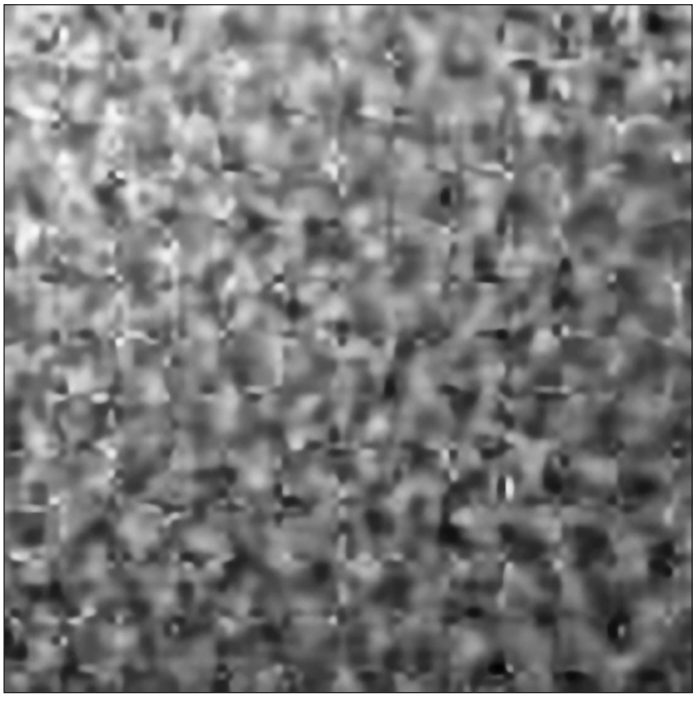

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Received December 11, 2017
Revised December 14, 2017
Accepted December 14, 2017

Generative Adversarial Networks (GANs) are a class of Artificial Intelligence that consist of a generative neural network and a discriminative neural network (Goodfellow et al., 2014). The generative neural network learns to imagine fake images, and the discriminative neural network learns to distinguish between "real" and "fake" images. Learning enables the discriminative neural network to discriminate more effectively, while enabling the generative neural network to imagine (or generate) concrete shapes. The fake images, created by the generative neural network, contain characteristics of the real images that were used as the input data for the GAN. In this study, we used atomic resolution graphene images as input data, obtained by an aberration-corrected FEI Titan Cubed TEM (FEI Titan^3 G2 60-300) to train this GAN. This image is the output of the GAN imagined by the generative neural network. It has a contrast and signal to noise ratio similar to the original image. It is also believed to include the physical and structural characteristics of the graphene image input by the interpretable representation learning study (Chen et al., 2016). Furthermore, this technology can be used as a criterion for neural network's comprehension about transmission electron microscopy.

[The 3rd East-Asia Microscopy Conference, *Novus Imago* Best Technical Award]

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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