Translations in JM³

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Developments in science and technology have always been a global affair. While most peer-reviewed science publications today are in the *de facto* standard language of English, there have been and continue to be many papers of importance published in other languages. Since professionally translating a published scientific article into English (or any other language) is difficult and expensive, it is rarely done. Occasionally, however, the scientific and historic importance of a work justifies this effort.

Sometimes these papers are of particular importance to the readership of JM³. Our community has been fortunate to have in our midst multilingual scientists and engineers willing to put forth the considerable effort required to translate several important papers of special relevance to lithography and publish them in JM³ as a part of our *Classic Papers* series. In 2002 Anthony Yen translated the classic Frits Zernike paper "Diffraction theory of the knife-edge test and its improved form: the phase-contrast method,"[1] which defined what we now call the Zernike polynomial to describe aberrations. And last year Martin Burkhardt translated Walter Schottky's seminal paper defining shot noise, just in time for its 100-year anniversary.[2]

In this issue of JM³ we are very pleased to add another translation in our *Classic Papers* series: H. Gamo's "Mathematical analysis of intensity distribution of the optical image in various degrees of coherence of illumination."

In optical lithography image simulation, representing the image by eigenvalue and eigenfunction of the transmission cross coefficient, or equivalently the phase coherence factor, is a *de facto* standard due to its computation speed and compatibility with lithography simulation. When we track down the reference of this technique, we may end up with finding Gamo's review paper of 1964,[3] written in English. The original paper on which the review was based was written by Gamo in 1956.[4] In spite of its dense and important contents, this original paper has not been well known, perhaps due to its availability and its being written in Japanese.

Gamo's paper introduces a matrix approach on how to represent partially coherent imaging by eigenvalue and eigenfunction obtained by decomposing the phase coherence factor. He also points out some insightful properties of partially coherent imaging. One of them is coherent approximation of the image by selecting the eigenfunction with the greatest eigenvalue, which has been further refined for the application in lithography.[5] In addition, its unique approach is based on information theory, which leads to measuring the degree of coherence by entropy calculated from the eigenvalue. Although we benefit from Gamo's paper, we know little about how it was developed and what it proposed. Thus, in this issue of JM³, Gamo's paper was translated into English to provide readers an opportunity to investigate one of the earliest works on the matrix theory of partially coherent imaging. For readers interested in more, another independent work can be found in Ref. 6.

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