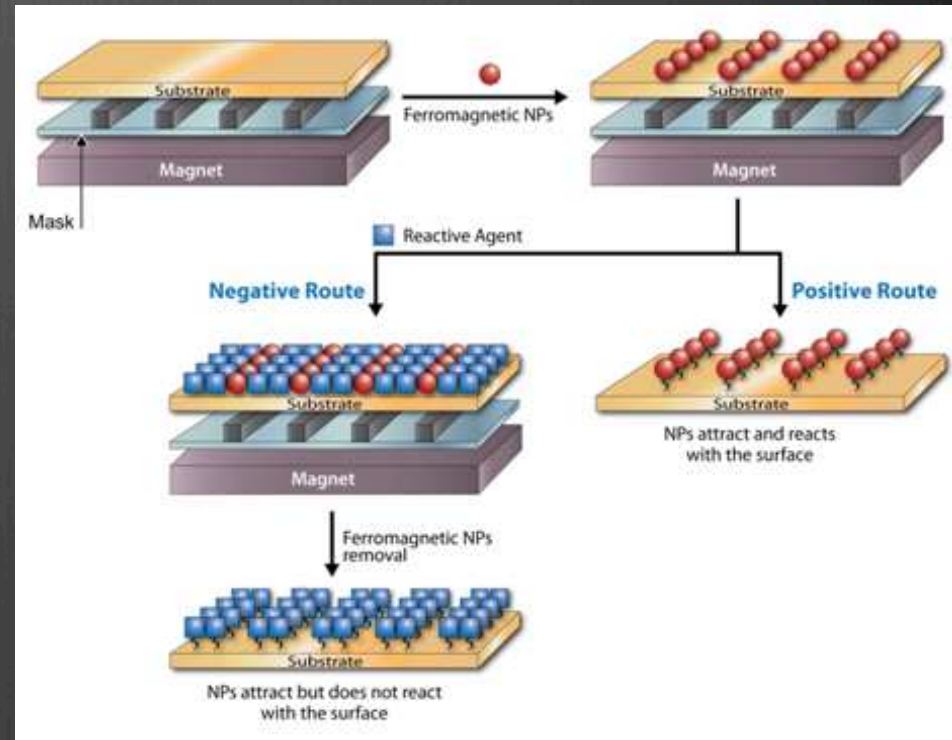
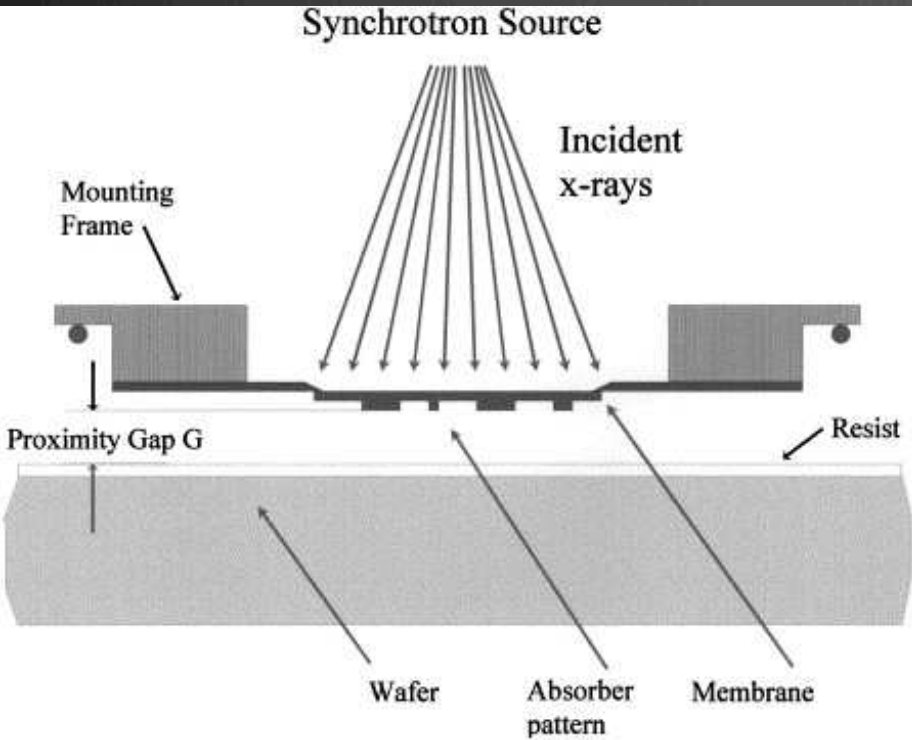


Fabrication Technologies

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September 24th, 2013

Lithography Types

Other lithography methods besides photolithography discussed in lecture:



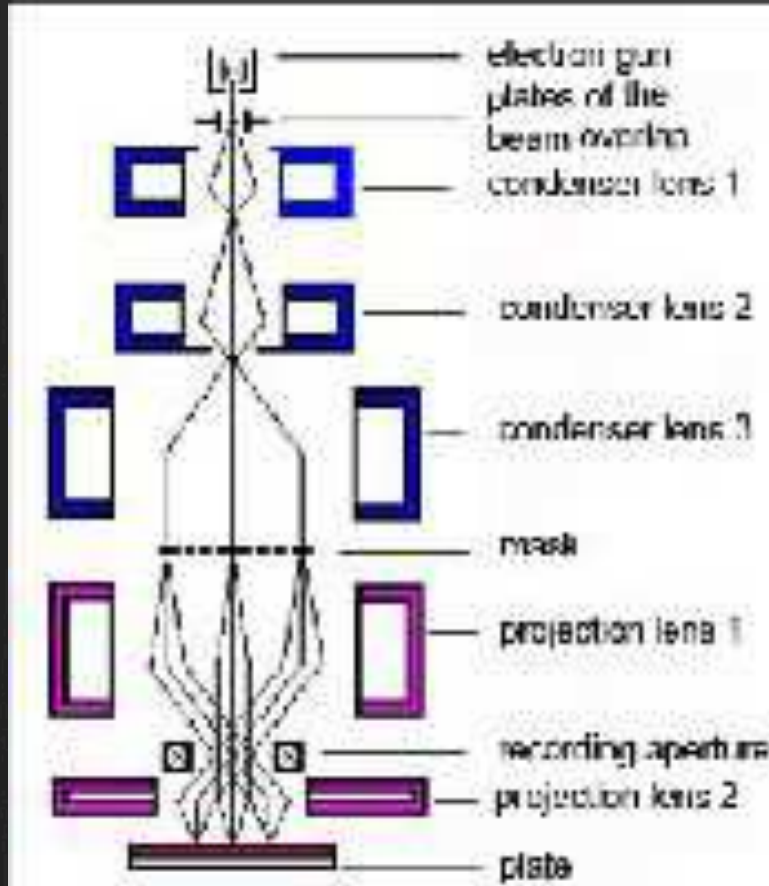
X-Ray Lithography

- Able to achieve smaller scale than photolithography with shorter wavelength
- Expensive mask

Magnetolithography

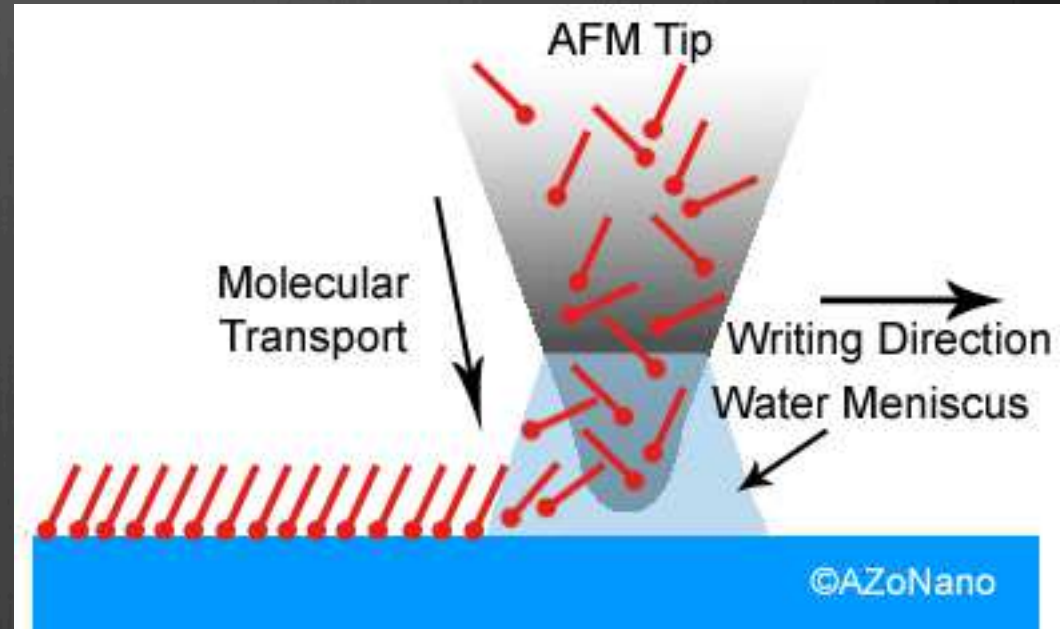
- Ferromagnetic material = photoresist, Paramagnetic mask = photomask
- Can pattern non-flat surfaces

Lithography Types



Electron Beam Lithography

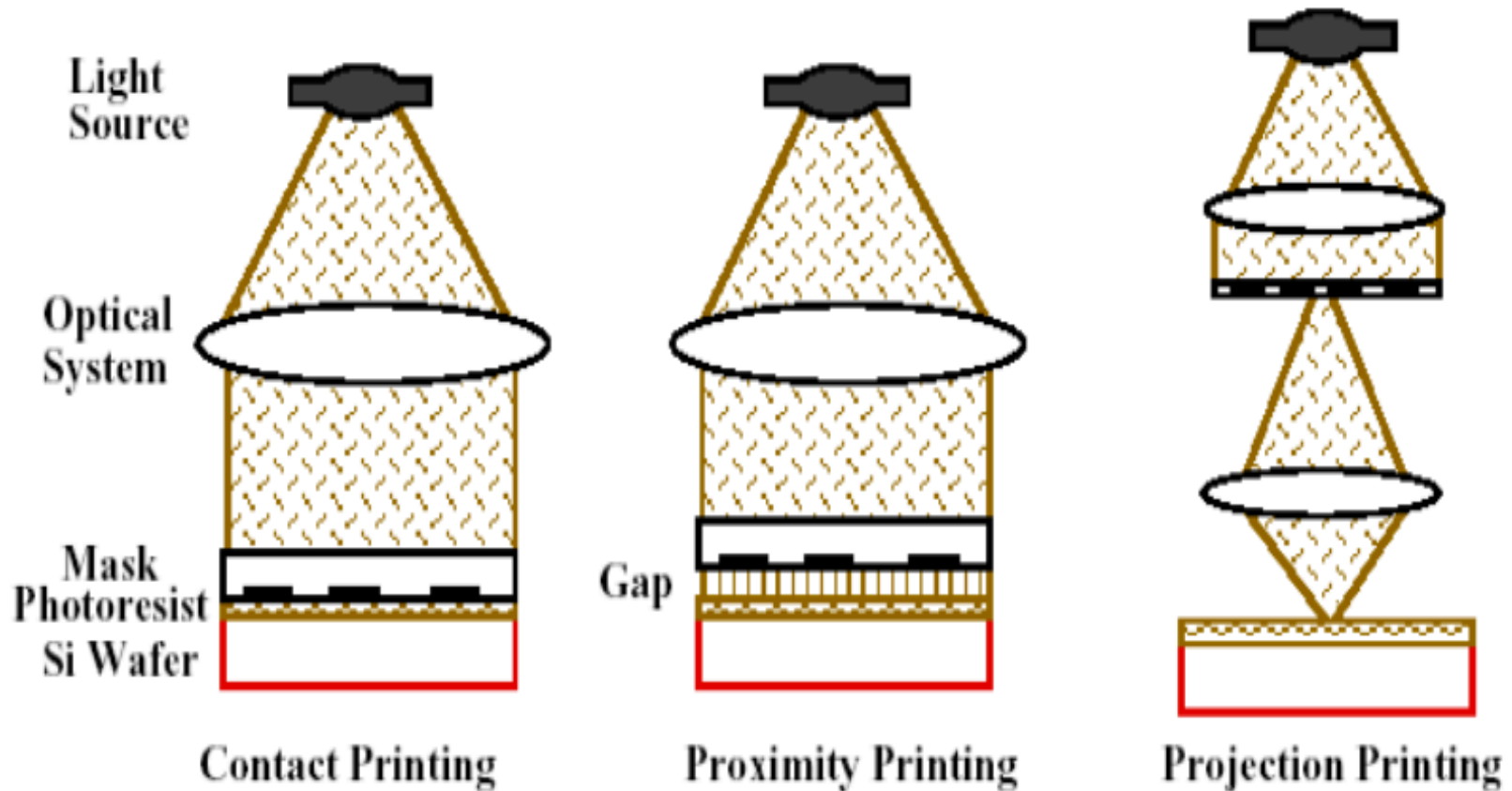
- Very precise, and no mask required (direct writing)
- Slow production. Mostly used for making photomasks.



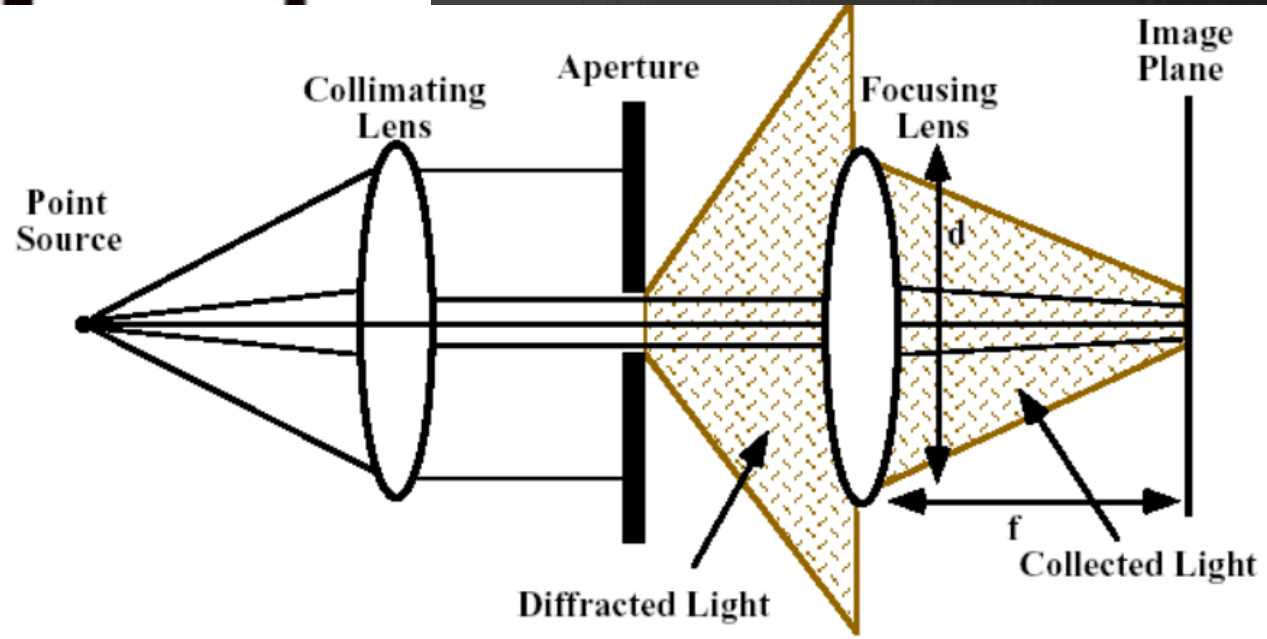
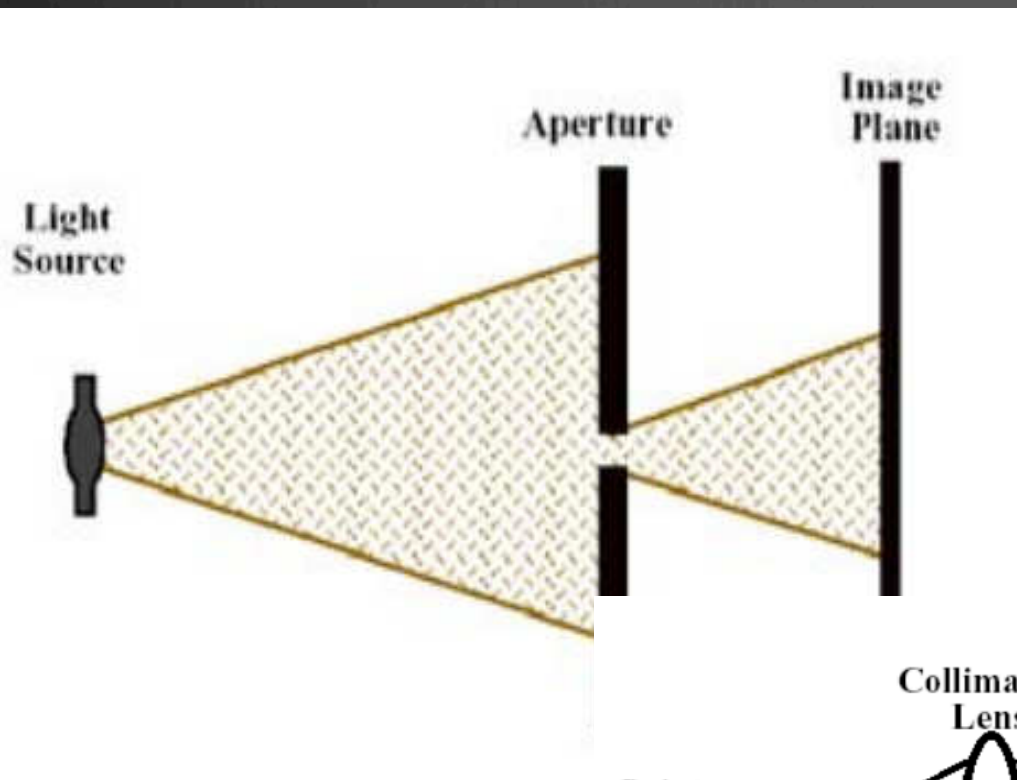
Dip-Pen Nanolithography

- Can pattern non-traditional materials using Atomic Force Microscope tip
- Environment sensitive (temperature, humidity, etc.)

Photolithography Exposure Systems



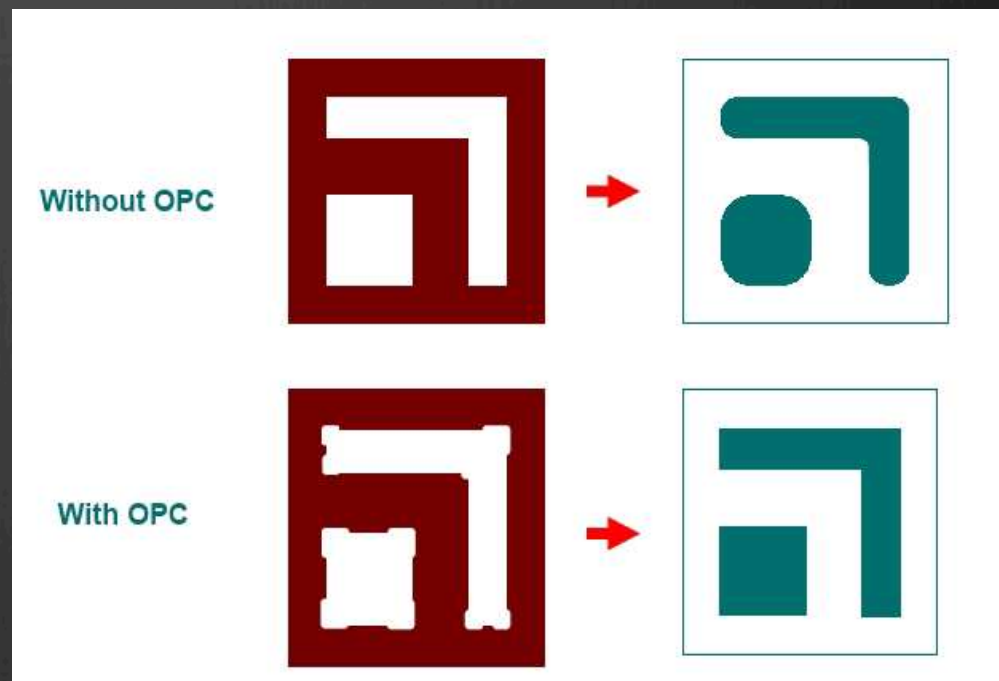
Distortion



Optical Proximity Correction (OPC)

Systematic Error

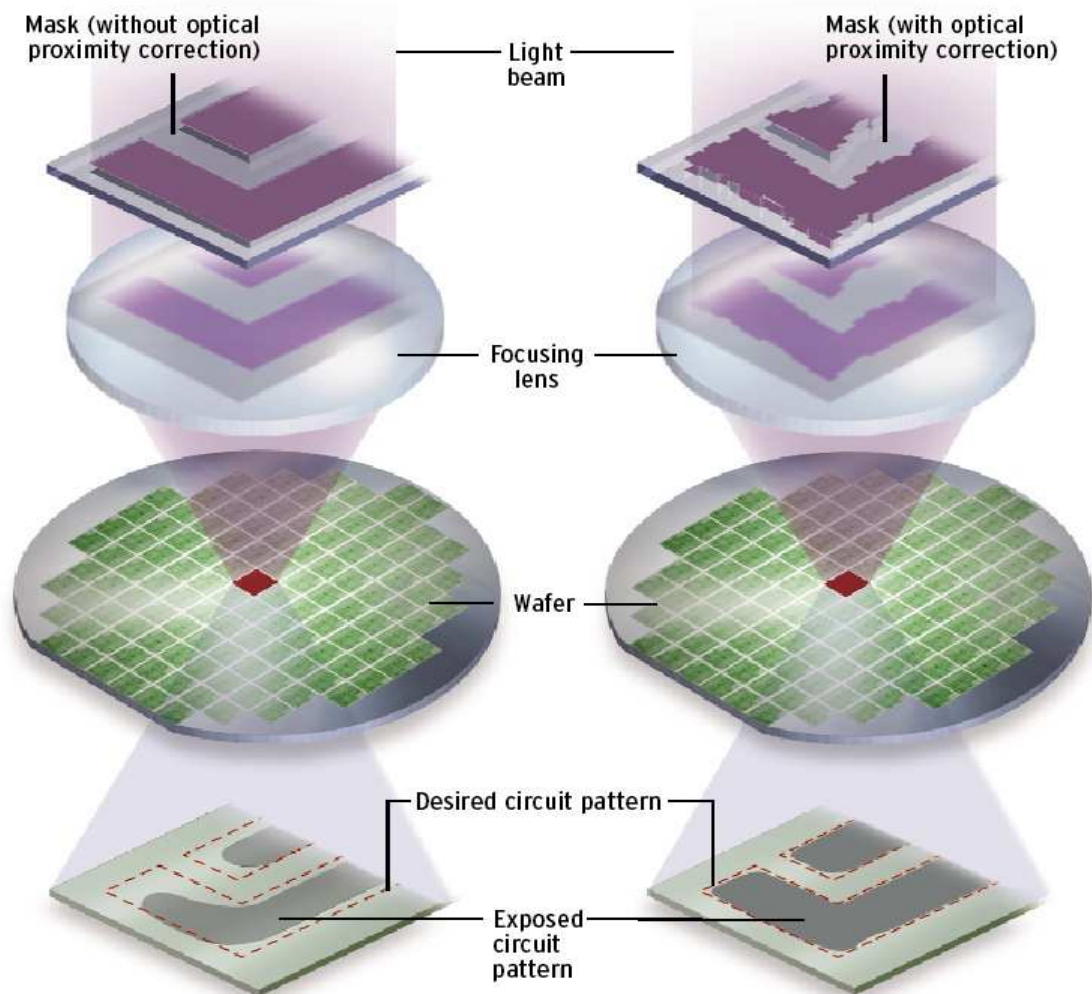
OPC mask attempt to reverse the situation by having a distorted image on the mask that is design to, produce a perfect image on the resist.



Optical Proximity Correction

● Squaring the Corners

Rounded corners and shortened lines [left] are typical of the distorting effects in the exposed pattern due to current wavelengths and feature sizes. Optical proximity correction makes subresolution changes in the shape of the pattern on the mask to counter the effects [right]: corners are squarer and lines longer.



Thank You

Photo References

- ⊗ <http://www.weizmann.ac.il/chemphys/naaman/content/research-1>
- ⊗ <http://eng.thesaurus.rusnano.com/wiki/article1093>
- ⊗ <http://www.azonano.com/article.aspx?ArticleID=1746>
- ⊗ <http://www.sciencedirect.com/science/article/pii/S016943329900478X>
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