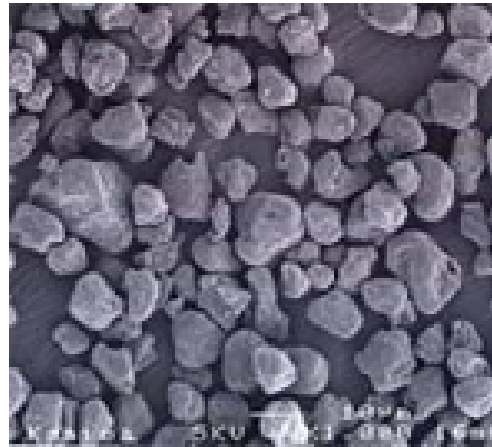
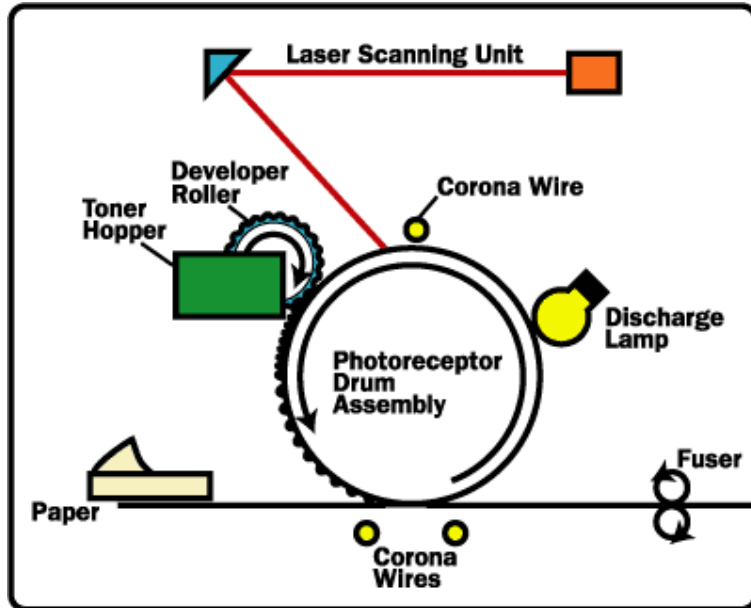
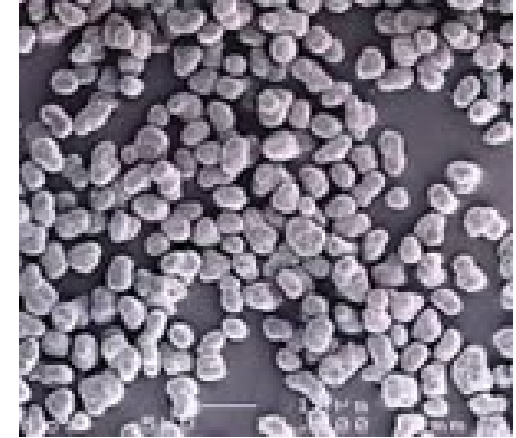


# Investigating Indoor Air Quality

**Toner** is a powder used in laser printers and photocopiers to form the text and images on the printed paper.



Typical low quality toner - low circularity and heterogeneous



Typical high quality toner - high circularity and homogeneous

<http://www.malvern.com/LabEng/industry/toners/shape.htm>

Most toners manufactured comprise around 90% thermo-plastics that are colored with 10% carbon black pigment.

Direct electrostatic printing involves a toner source which delivers charged toner particles through a print head structure to the image receiver.

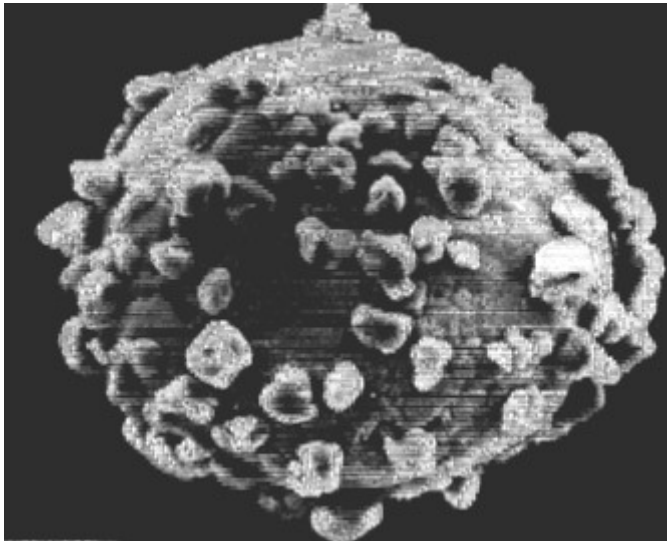


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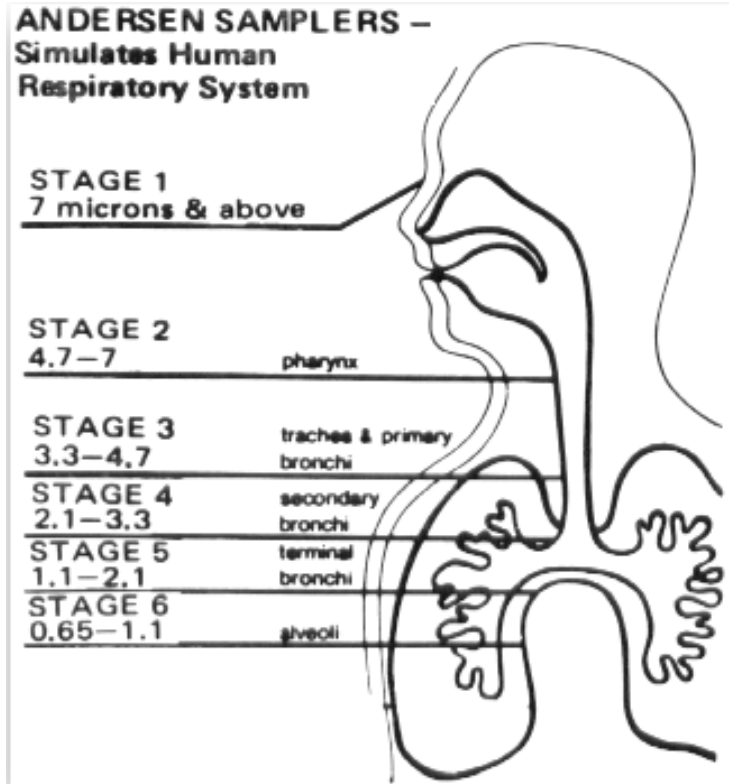
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The original particle size of toner averaged **14–16 micrometers** or greater. To improve image resolution particle size was reduced, eventually reaching about **8–10  $\mu\text{m}$**  for 600 dots per inch resolution.

<http://en.wikipedia.org/wiki/Toner>



A developer bead coated with small toner particles Photo courtesy Xerox



The image on the left shows how an air sampler was designed to capture the actual range of particles that enter the respiratory tract.

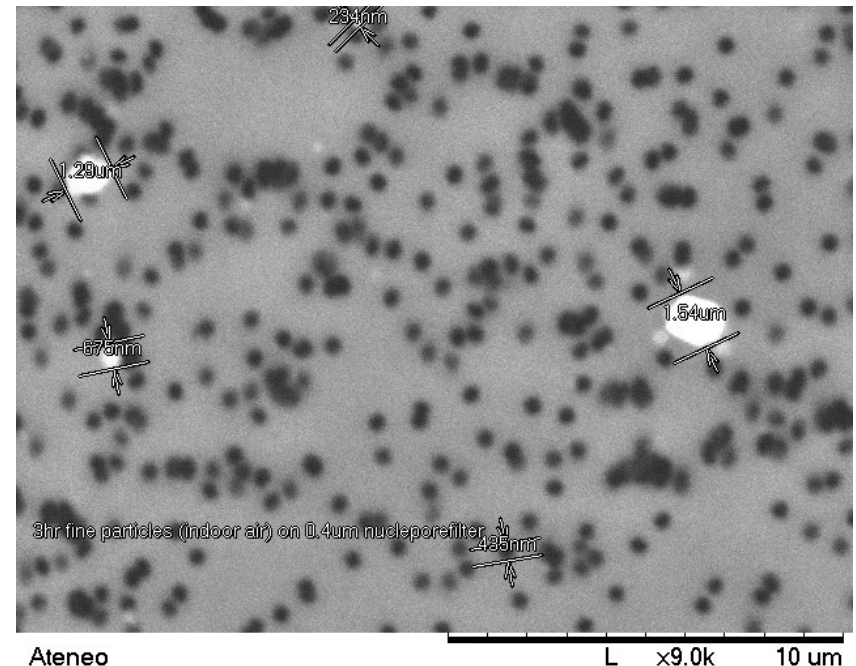
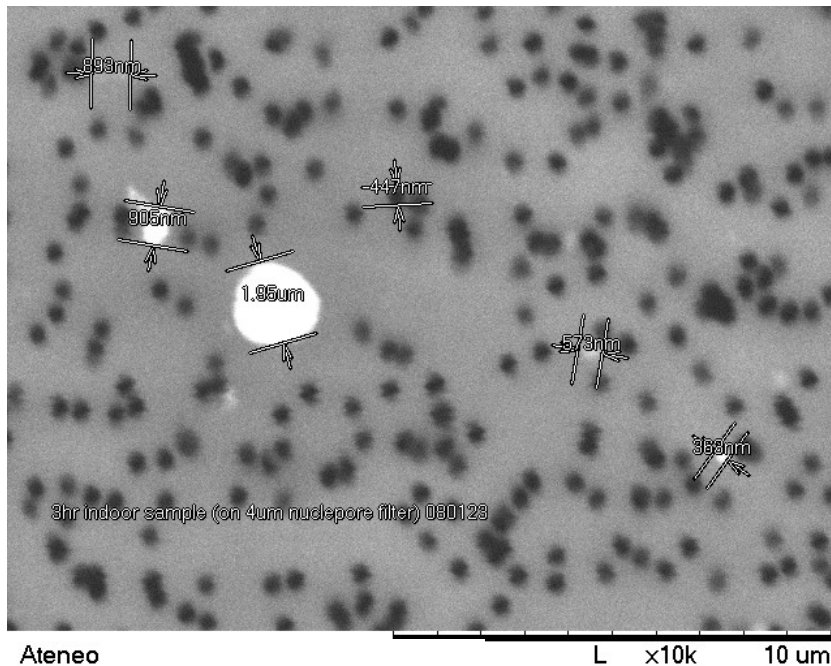
[www.pacwill.ca/images/6stage2.gif](http://www.pacwill.ca/images/6stage2.gif)

**Toner** dust belongs to the group of **respirable fine particles**, which upon inhalation are deposited predominantly in the **tracheobronchial and alveolar region**. A minor fraction may also be deposited in the nose, the larynx and the pharynx. (Ewers, Nowak 2006)



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# Investigating Indoor Air Quality



- SEM (TM-1000) images (above) of PM<sub>2.5</sub> collected from a photocopier room show **fine particulates** (white) up to a fraction of a micrometer in approximate diameter.
- Measured PM<sub>2.5</sub> Concentration inside a photocopier room (2-5pm 22 Jan 2008) was 28  $\mu\text{g}/\text{m}^3$ , lower than the outdoor daily average of 40  $\mu\text{g}/\text{m}^3$  (c/o Manila Observatory).
- Another run with PM<sub>10</sub> and TSP should be done, since larger particles are expected also.

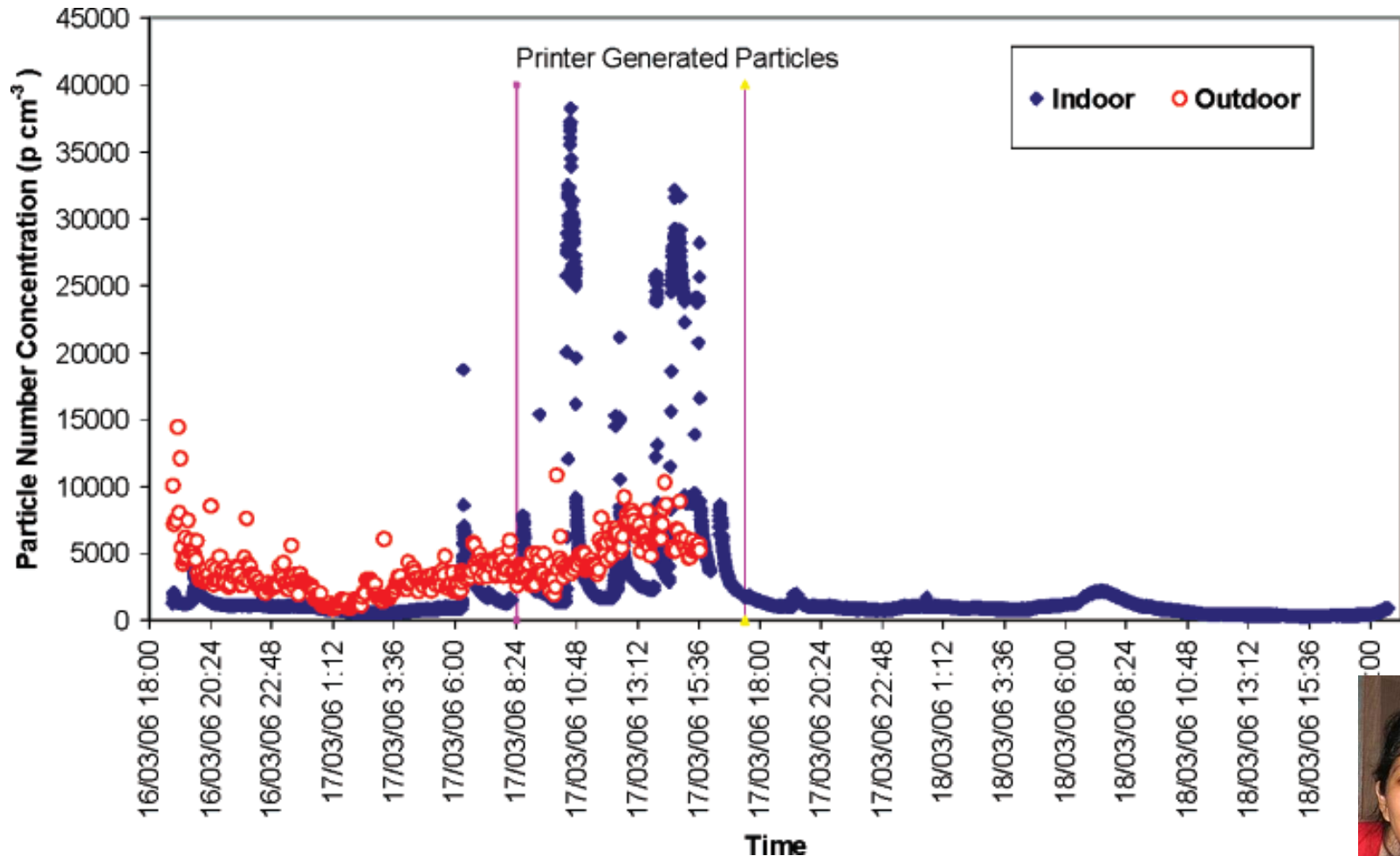


# Investigating Indoor Air Quality

## Particle Emission Characteristics of Office Printers

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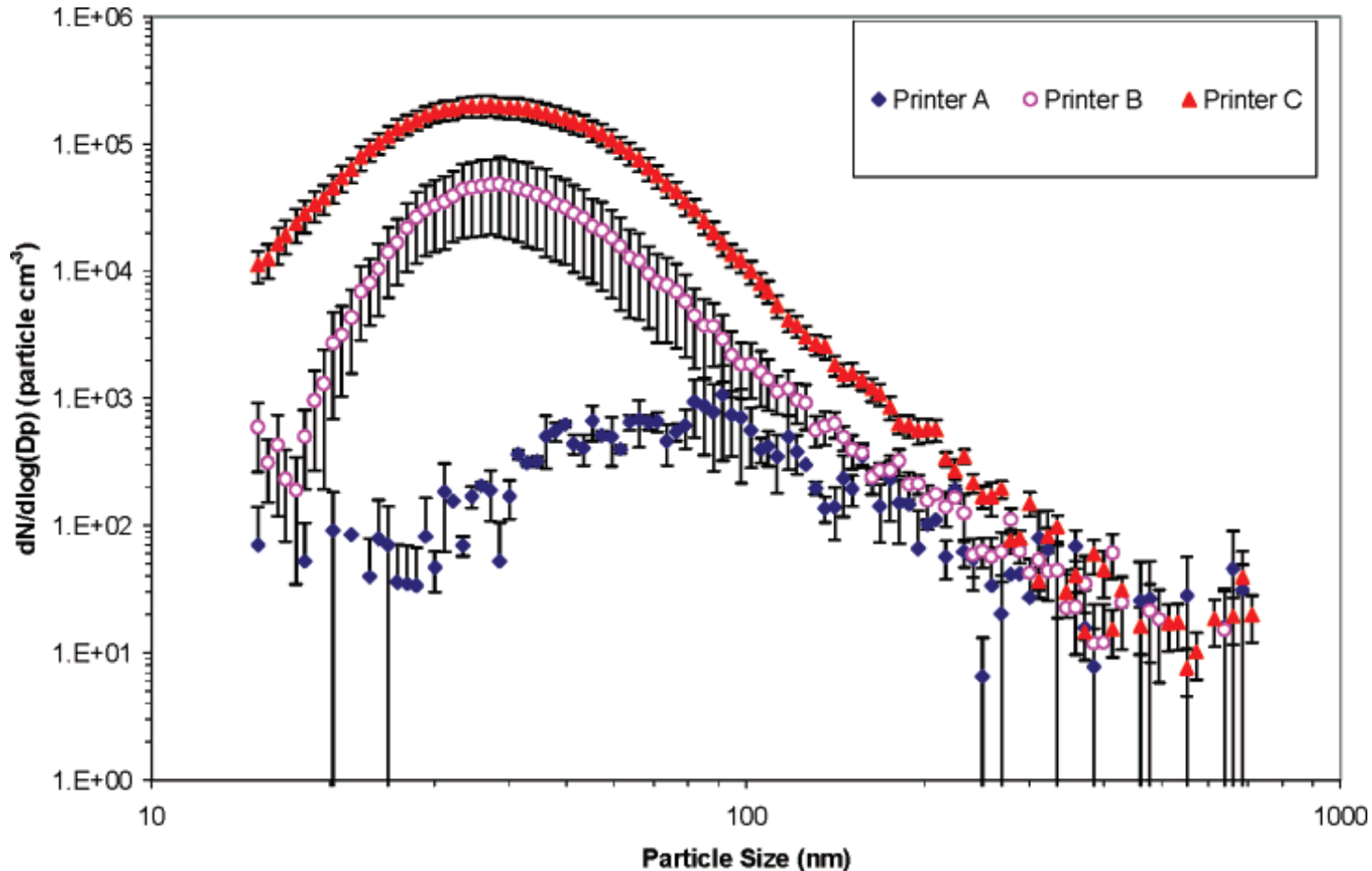


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Average particle size distributions of the particles generated by the three different printers. Error bars are standard errors.

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