

# Thermal Imaging of Single Cells

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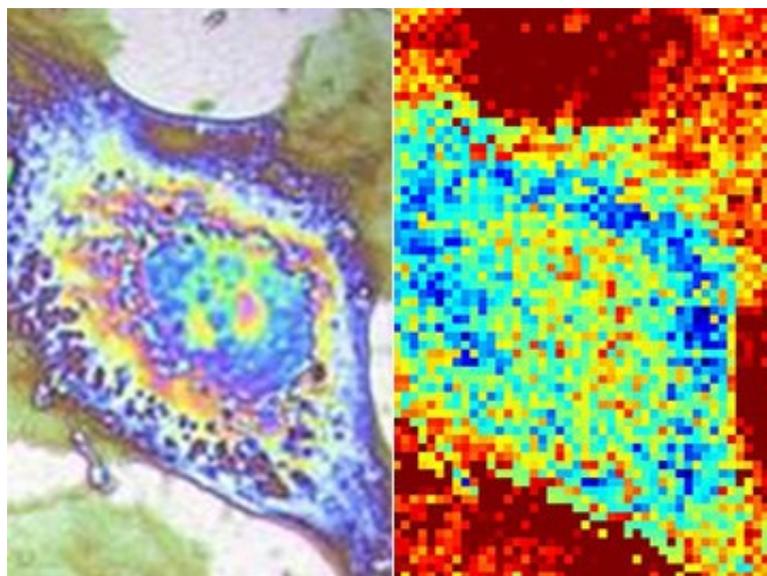
A team of researchers from France reports a new method for thermographically imaging individual cells. The imaging technique uses thermography camera technology—also used in night-vision goggles—and brings it down to the micrometer scale to record thermal activity in cells grown on a thin titanium sheet. The researchers say thermal signatures of cells could be useful in cancer diagnostics and would complement data collected using standard histological methods.

A cell's ability to exchange heat with its environment provides important information about its activity. For example, a cancer cell has a higher metabolism than a normal cell, giving it a stronger thermal signature. A cellular “heat map” could give physicians the ability to not only identify cancer cells, but also determine the effectiveness of anti-cancer therapeutics.

To test their thermal microscopy method, the researchers grew cells on a titanium sheet that served as a thermo-elastic lens. A micrometric spot on the underside of the titanium sheet was then “flash heated” with a Ti-sapphire mode-locked laser. If there wasn't a cell on the other side of the spot, heat from the laser remained in the titanium sheet and caused a slight deformation; if there was a cell on the other side, the cell absorbed the heat from the laser and created a cold spot on the titanium sheet.

The researchers observed that heat absorption varied within the cell—for example, the nucleus absorbed more heat than other intracellular structures. Thermo-elastic deformations in the titanium sheet were picked up by a second laser and translated into a 2- $\mu\text{m}$ -resolution thermal map of the individual cells within the micrometric spot.

Corresponding author Thomas Dehoux, CNRS, says in a press release that these thermal images may “... reveal new information about the behavior of cells because we will be able to observe them with a new contrast.” The researchers are working to optimize their thermal imaging technique and would like to someday test the effect of anti-cancer drugs on the thermal properties of cancer cells.



Left: A classical phase contrast microscopy image of a cell. Right: A thermal contrast microscopy image of the same cell. *Credit: Bordeaux University, France*