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An electro-optic experimental study of an unusual liquid crystal phase transition DANIEL STAINES, DEREK WICKS, AUSTIN HAVENS, JONATHAN FERNSLER, Cal Poly - San Luis Obispo — Liquid crystal phases are highly sensitive to their surroundings and they interact with light in unusual ways: the index of refraction is different depending on the polarization of the incident light. This combination of properties makes them ideal for low-power liquid crystal displays (LCD's), ubiquitous in today's portable electronic devices. They are also beautiful: optical textures of liquid crystals show bright colors, with the color corresponding to the amount of retardation in the light polarized along different axes. These phases are fluid, but can nevertheless be highly ordered. We have developed a novel experimental analysis using a photometric calculation of microscopy images to perform a series of experiments on several liquid crystal materials, called "de Vries" smectics. Using this system, we examined how the structure of these phases changed under the influence of different boundary conditions, temperature, and applied electric fields. These unusual materials show the bizarre behavior of appearing to become less ordered with decreasing temperature. This phase, which is not fully understood, has advantageous optical properties that could lead to the next generation of liquid crystal displays.

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