



SWEET, STRONG CRYSTALS

by Bernardo Cesare

Being a petrographer – a geologist specialising in the study and description of rocks – my natural relationship with microscopy has been primarily scientific and, when aesthetic, focussed on the fine slices of rocks and minerals that are called “thin sections”. Such slides are a common object of research for geologists, as their skilled microscopic inspection reveals key information about the mineralogical composition and history of rock samples.

But since I came across the marvelous micrographs of crystallised alcoholic beverages taken by late Michael Davidson from Florida State University - my favorite image is a light blue-green vodka - I had wanted to try with drinks myself.

Mike died on Christmas Eve 2015, and with this article I want to pay my tribute to his memory.

At the beginning I thought drops of alcoholic drinks should be frozen and I should capture the crystals of ice - or whatever compound forming from freezing - using a freezing stage like the one used in fluid inclusion research. This would represent quite a technical challenge. But Mike informed me he simply let the drinks dry and their sugars crystallise, a much easier procedure!

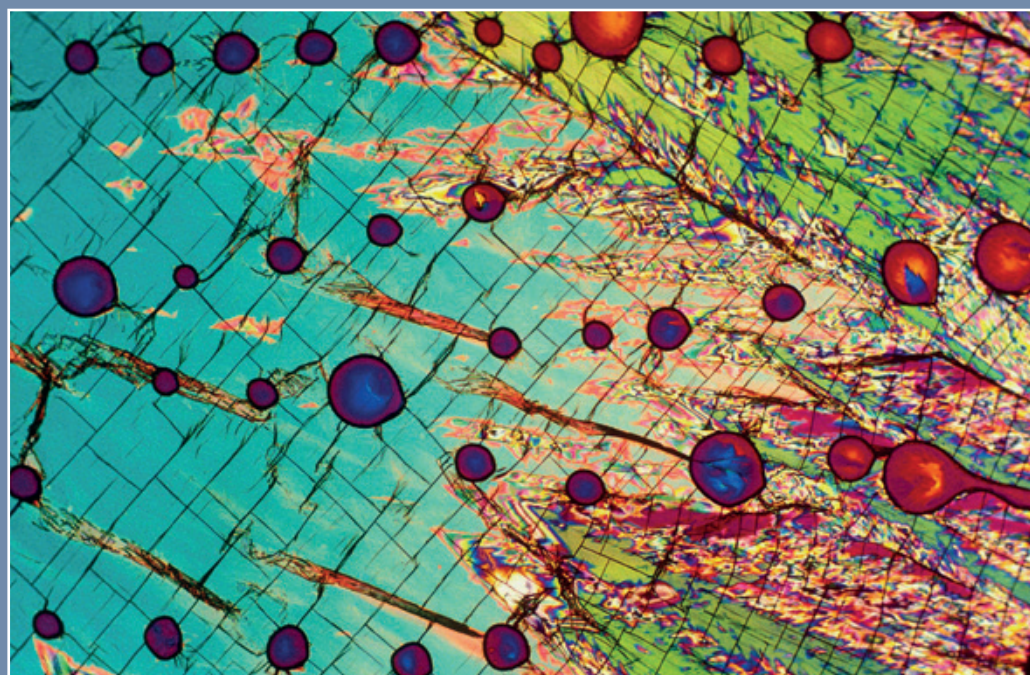
Looking for an original approach that wouldn't replicate Davidson's unbeatable artwork, I was inspired by a colleague who, after watching micrographs of beer and cocktails, told me: "You should try with spritz." Spritz is a venetian aperitif

made with seltz, white wine, and another liqueur (red or orange) giving the typical colour and a bitter or sweeter flavour.

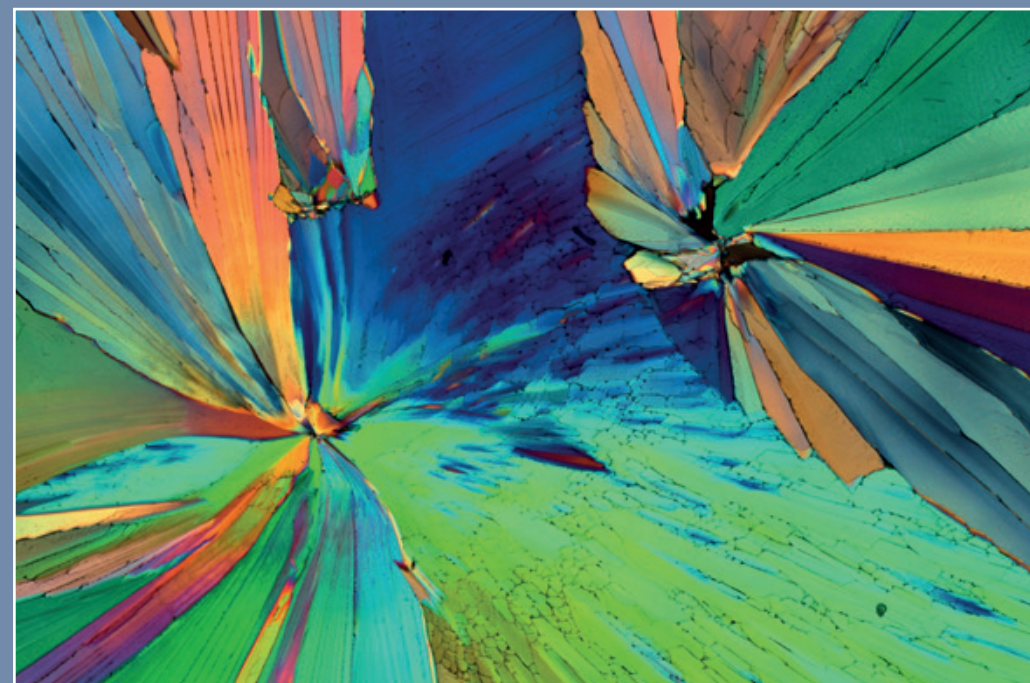
So I decided to take pictures of italian drinks under the polarising microscope: starting with Aperol and Bitter Campari, I recently added the excellent limoncello homemade by my mother-in-law.

Crystallising drinks is tricky, because they can be unpredictable. The first attempt I made was with small drops of Aperol placed on a glass slide: nothing happened for more than a month and then, suddenly, crystallisation was completed in about a day. This behaviour is no surprise to anyone involved in the kinetics of nucleation and growth of natural or synthetic crystals from solutions: it has to do with the degree of supersaturation that has to be reached before crystals start to form.

The compound crystallised after drying the liqueurs is sucrose ($C_{12}H_{22}O_{11}$), a common sugar, which is present in the drinks or has been added



Light blue-green vodka. Copyright Michael W Davidson, the Florida State University and BevShots®



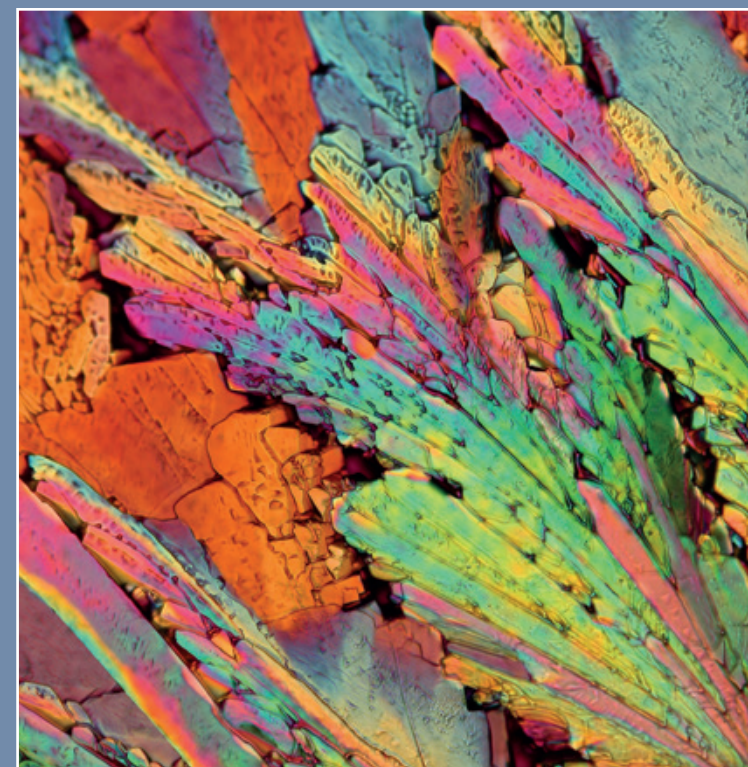
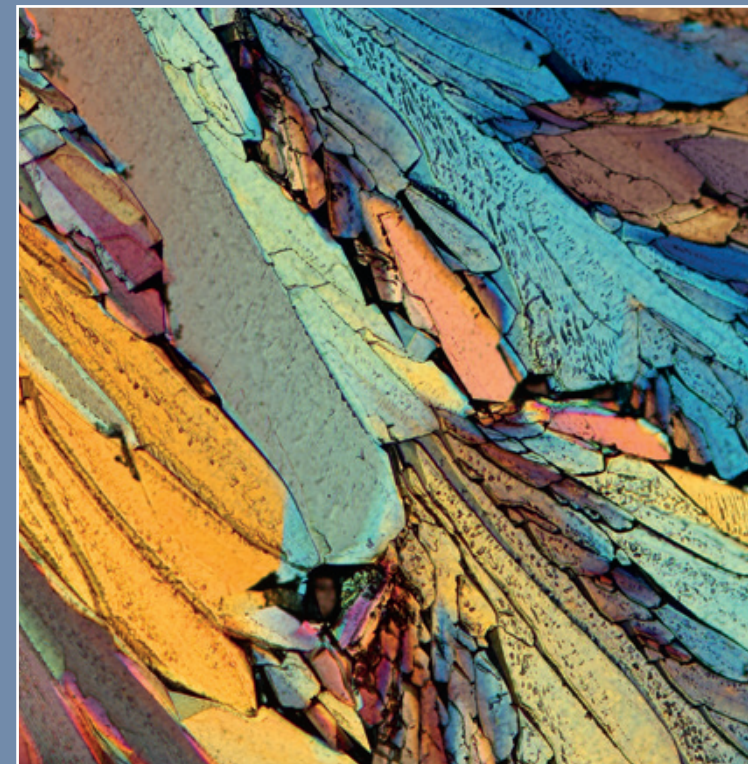
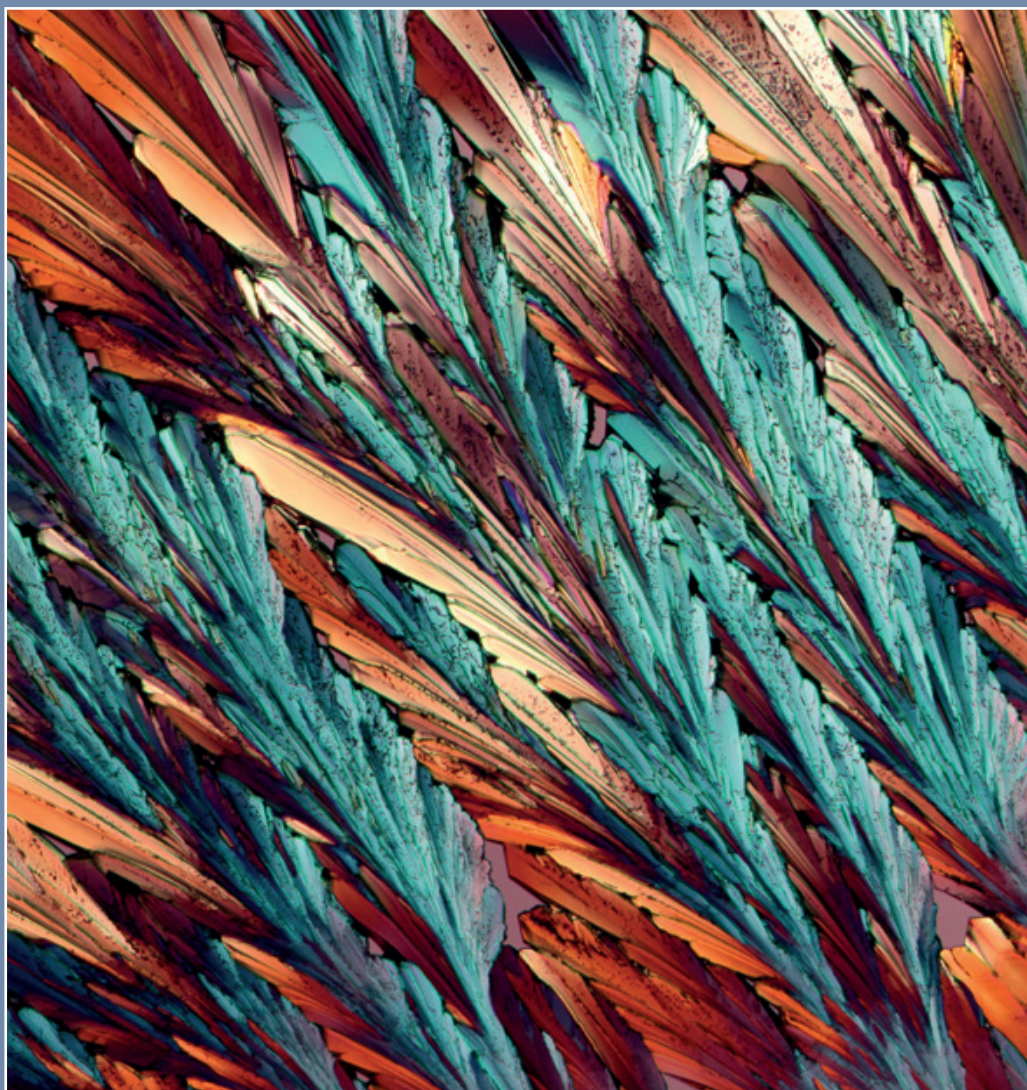
to them. It typically forms radiating aggregates of elongate crystals - in places needle-like, in places fibrous - with variable interference colours due to their different and systematically arranged crystallographic orientation. Unlike the very slow Aperol, complete crystallisation of Bitter Campari took only a few days. Limoncello was fast, too.

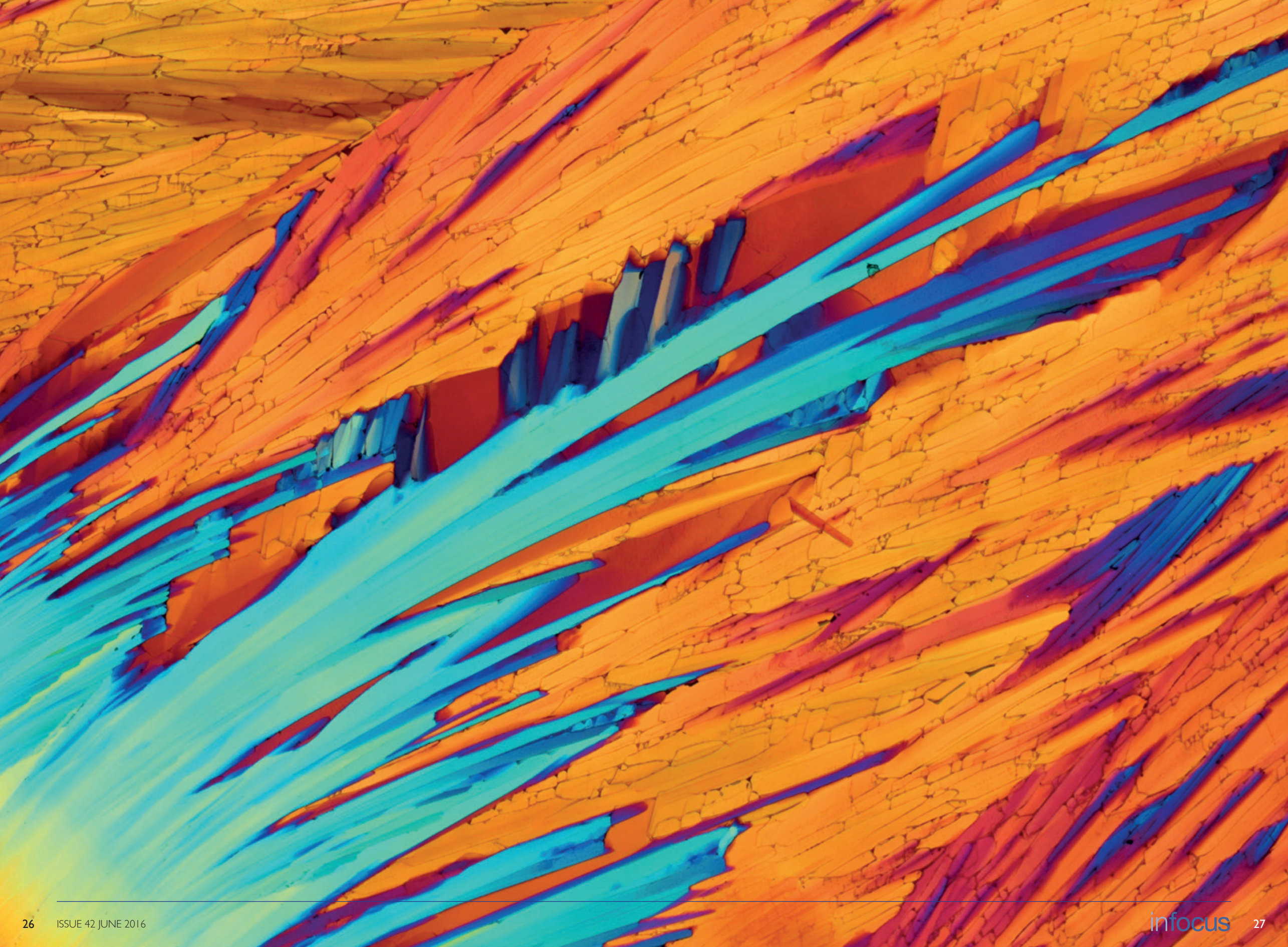
Unlike thin sections of rocks, which have a standard thickness of 30 micrometers, drops of sugar are thicker (up to a few hundreds of μm) and have a 3D relief that may require focus stacking when

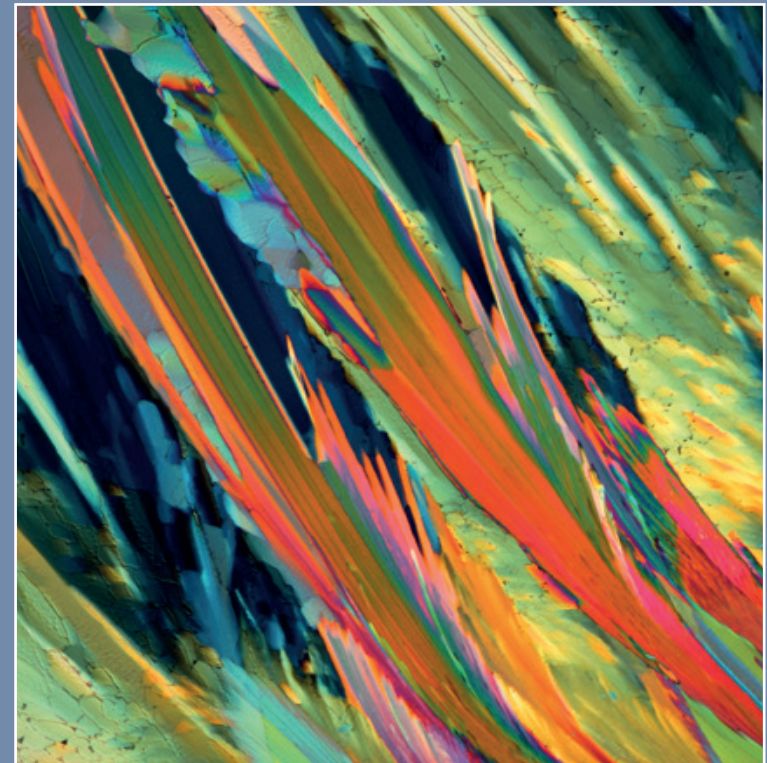
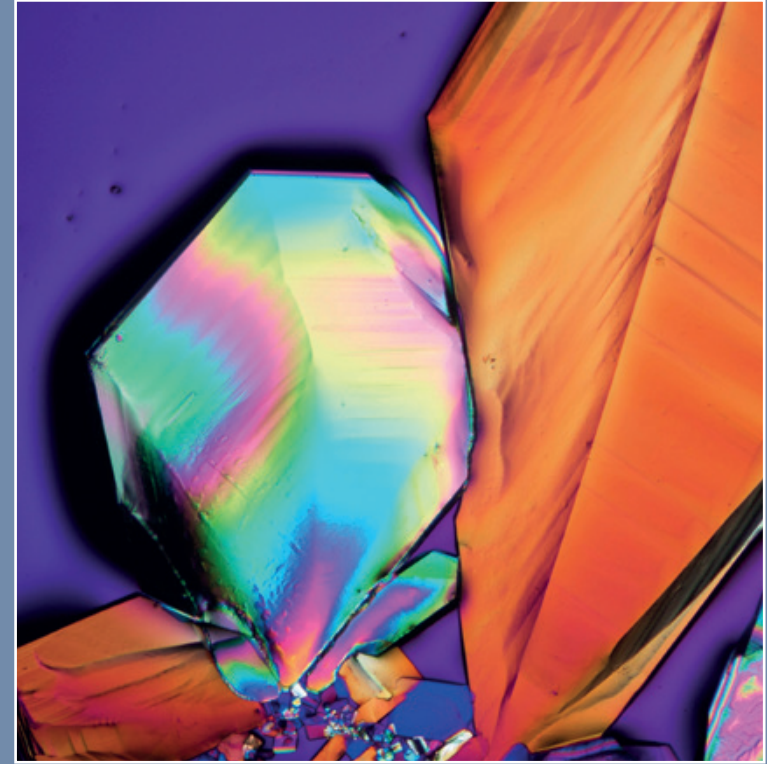
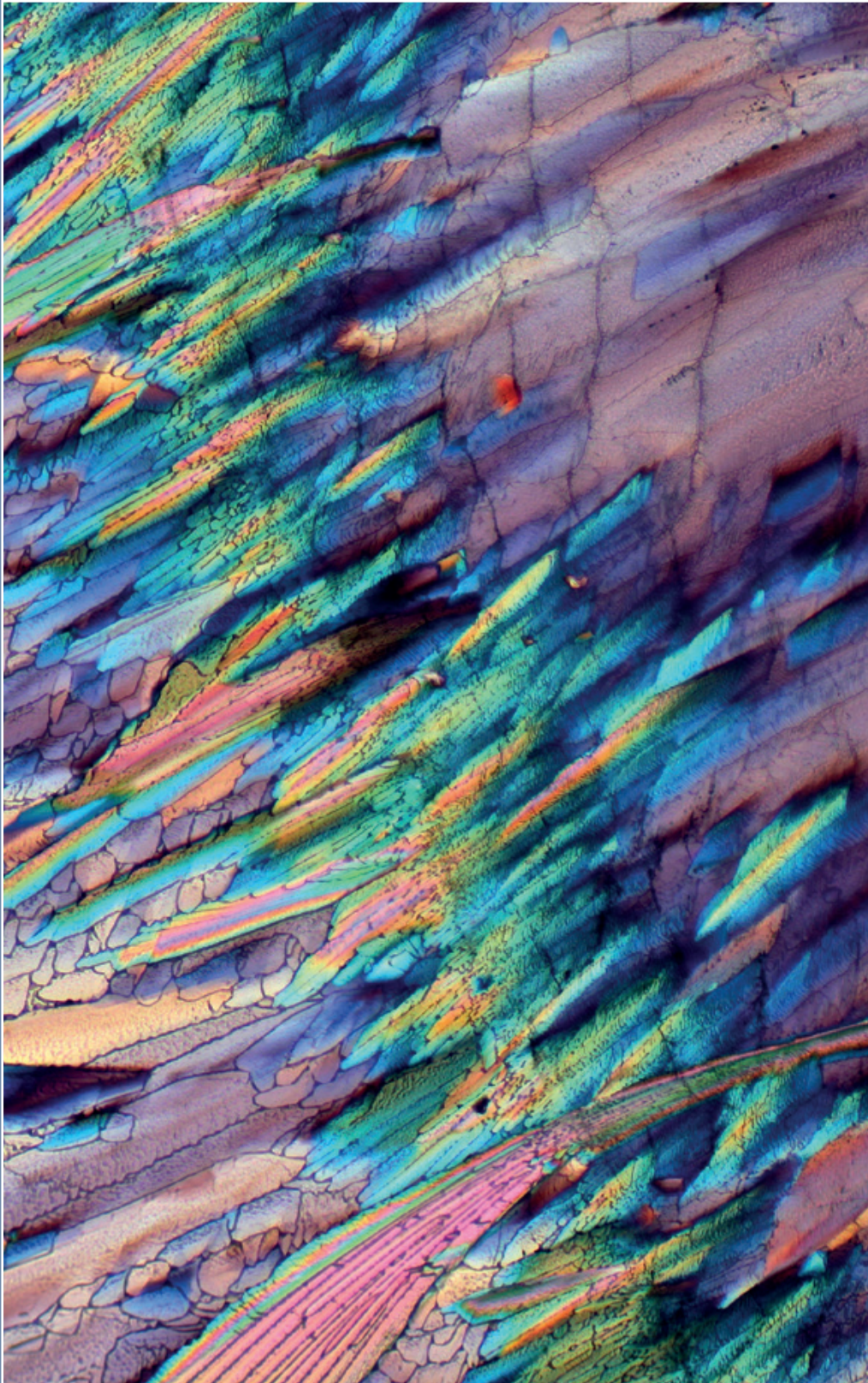
working on relatively large subjects. However, the photomicrographs presented here are single images.

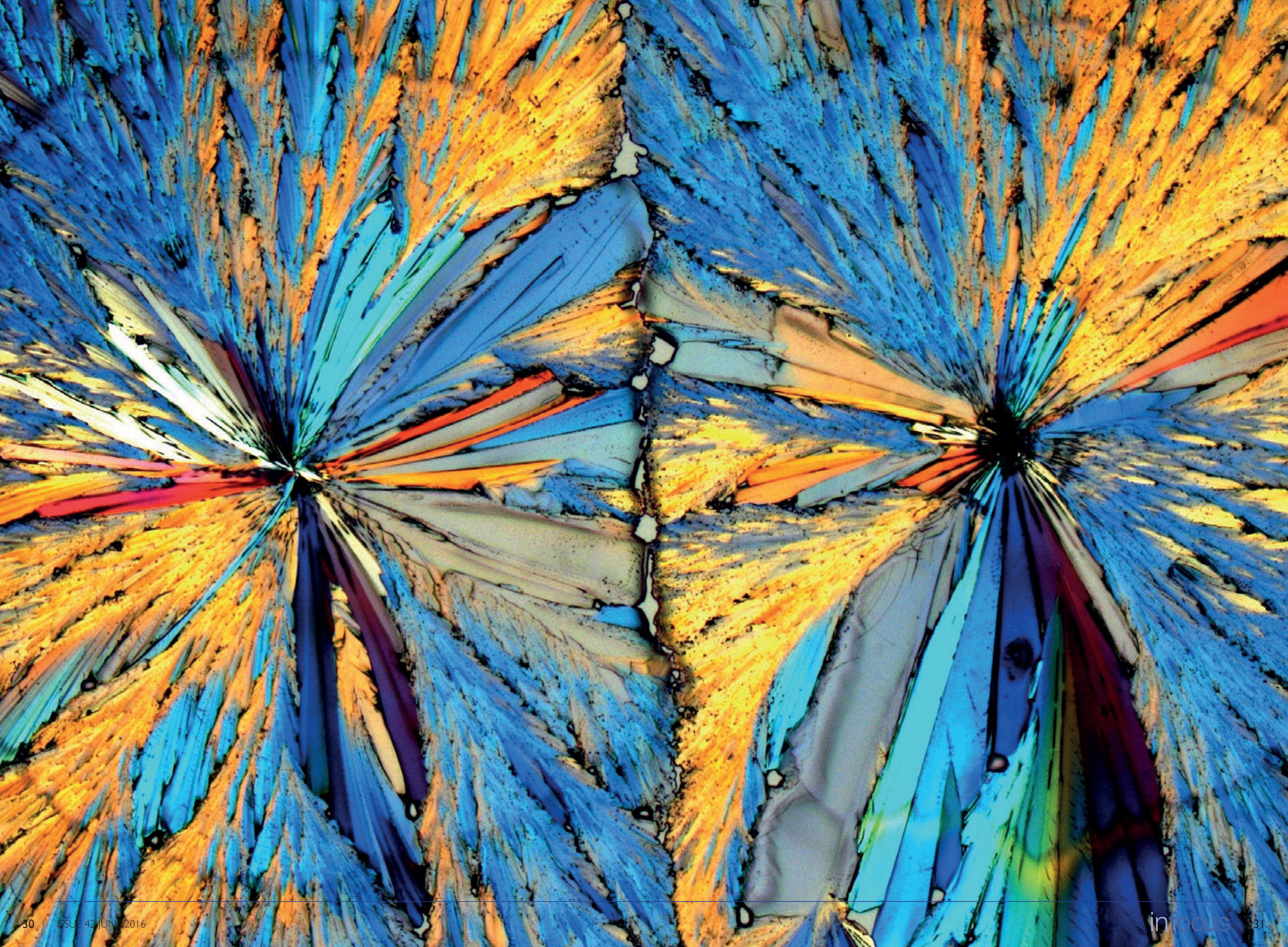
Micrographs were taken with a Canon 550D camera body adapted to the trinocular head of a Motic BA310 Pol microscope, with transmitted light, red tint plate, and objectives ranging from 2,5x to 10x. These magnifications provide long sides of view in the range of about 1 to 5 mm.

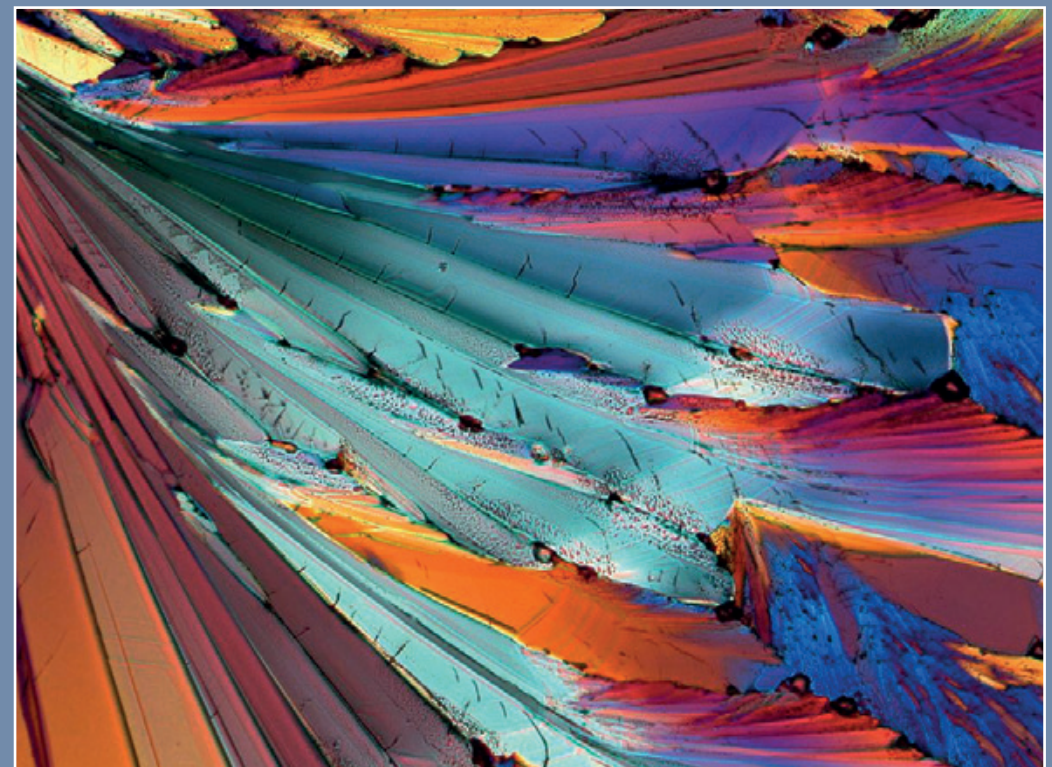
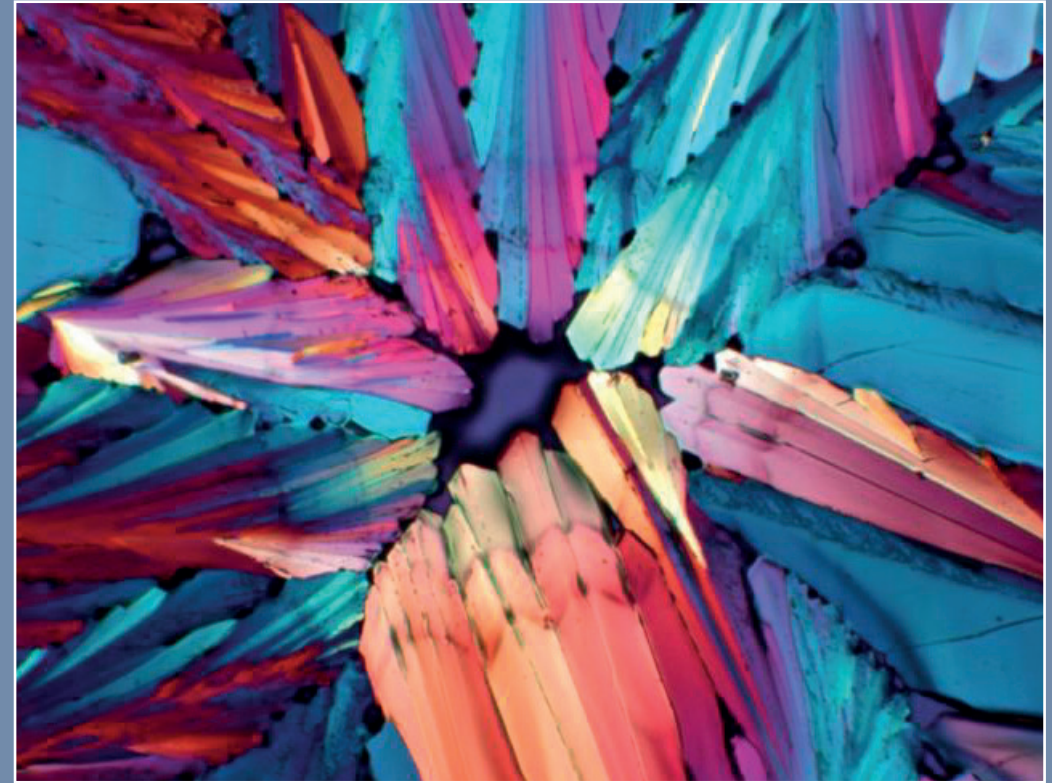
Enjoy these micrographs, but look responsibly and do not drive afterwards: alcohol can be dangerous!

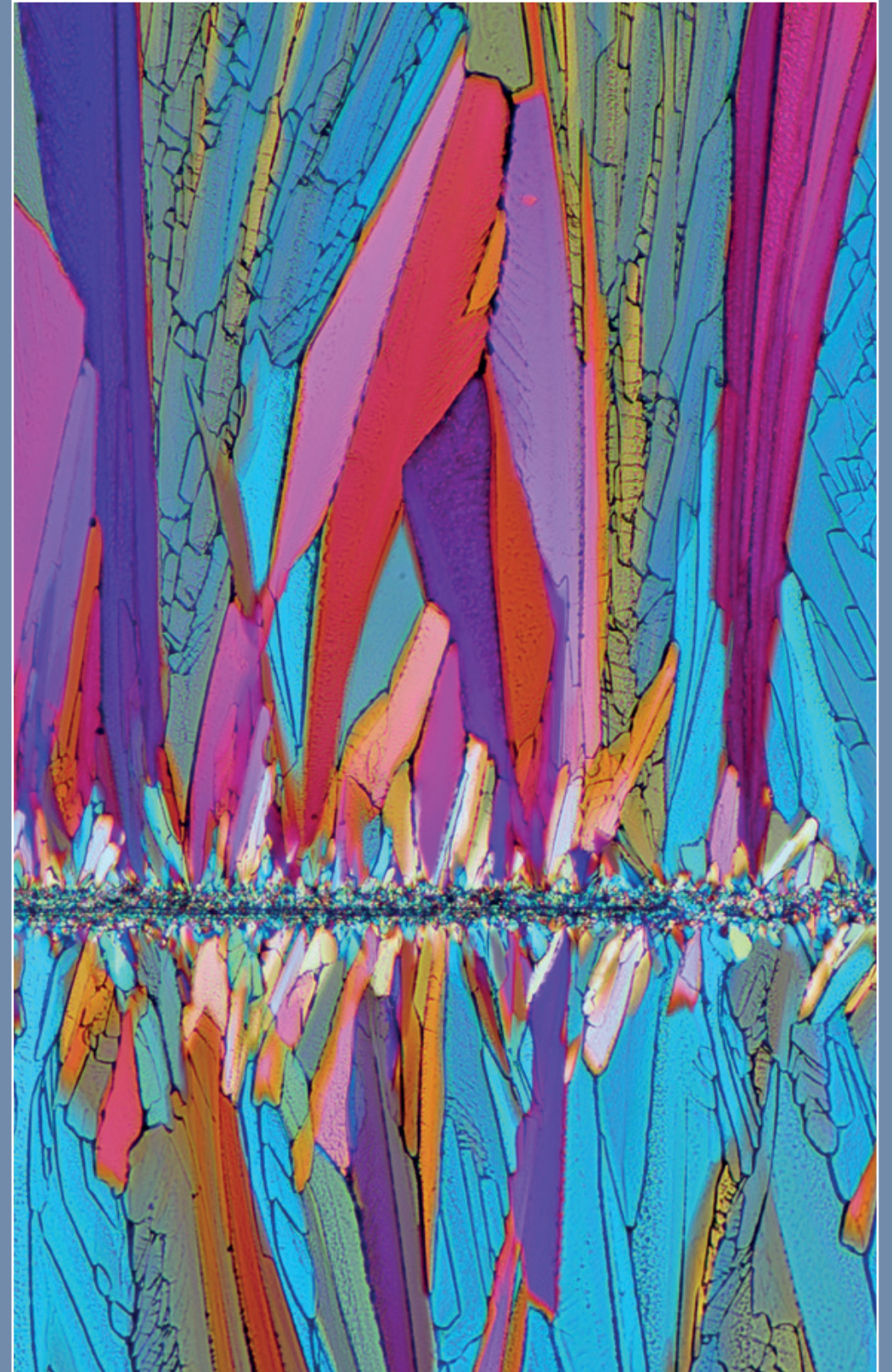
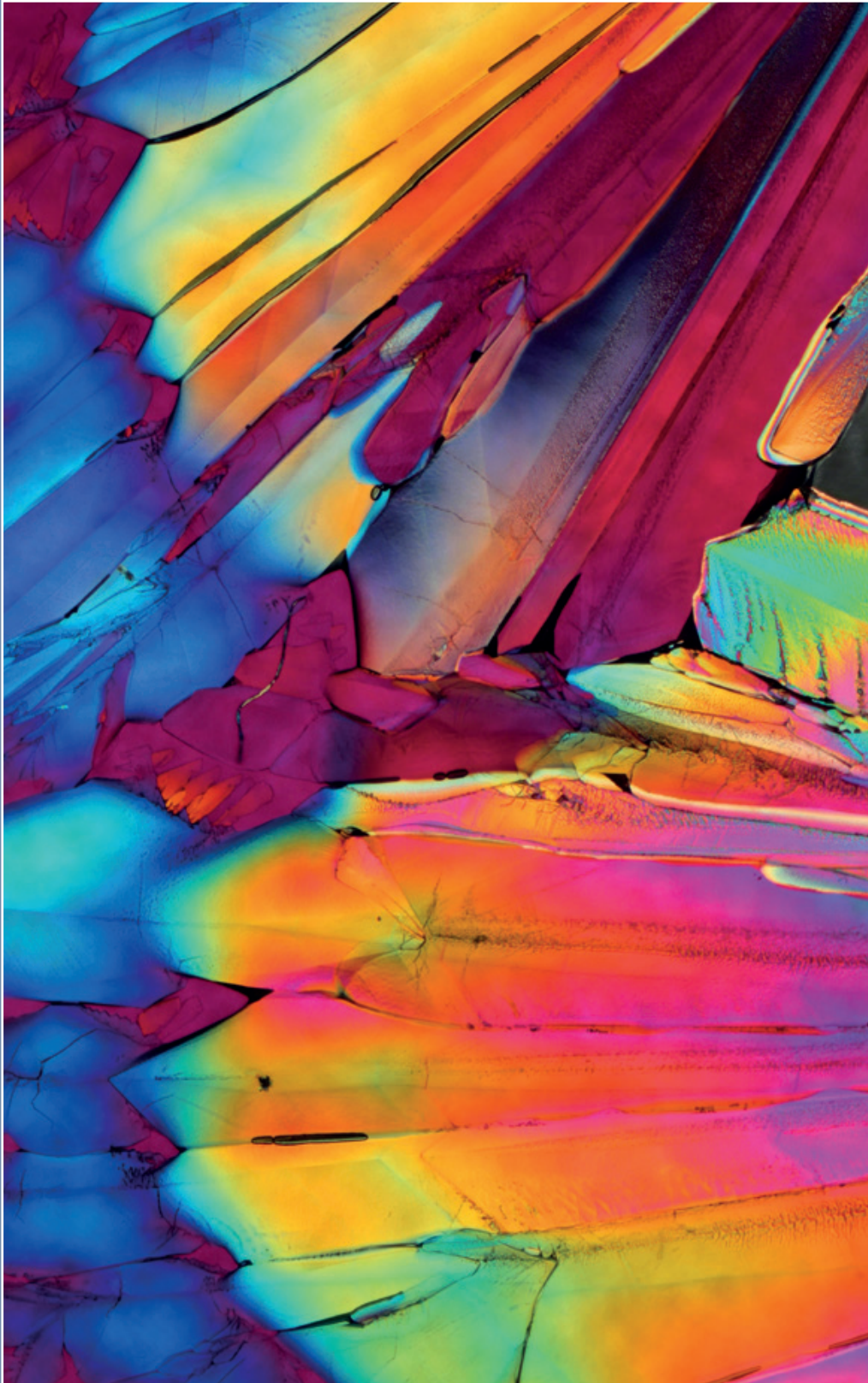


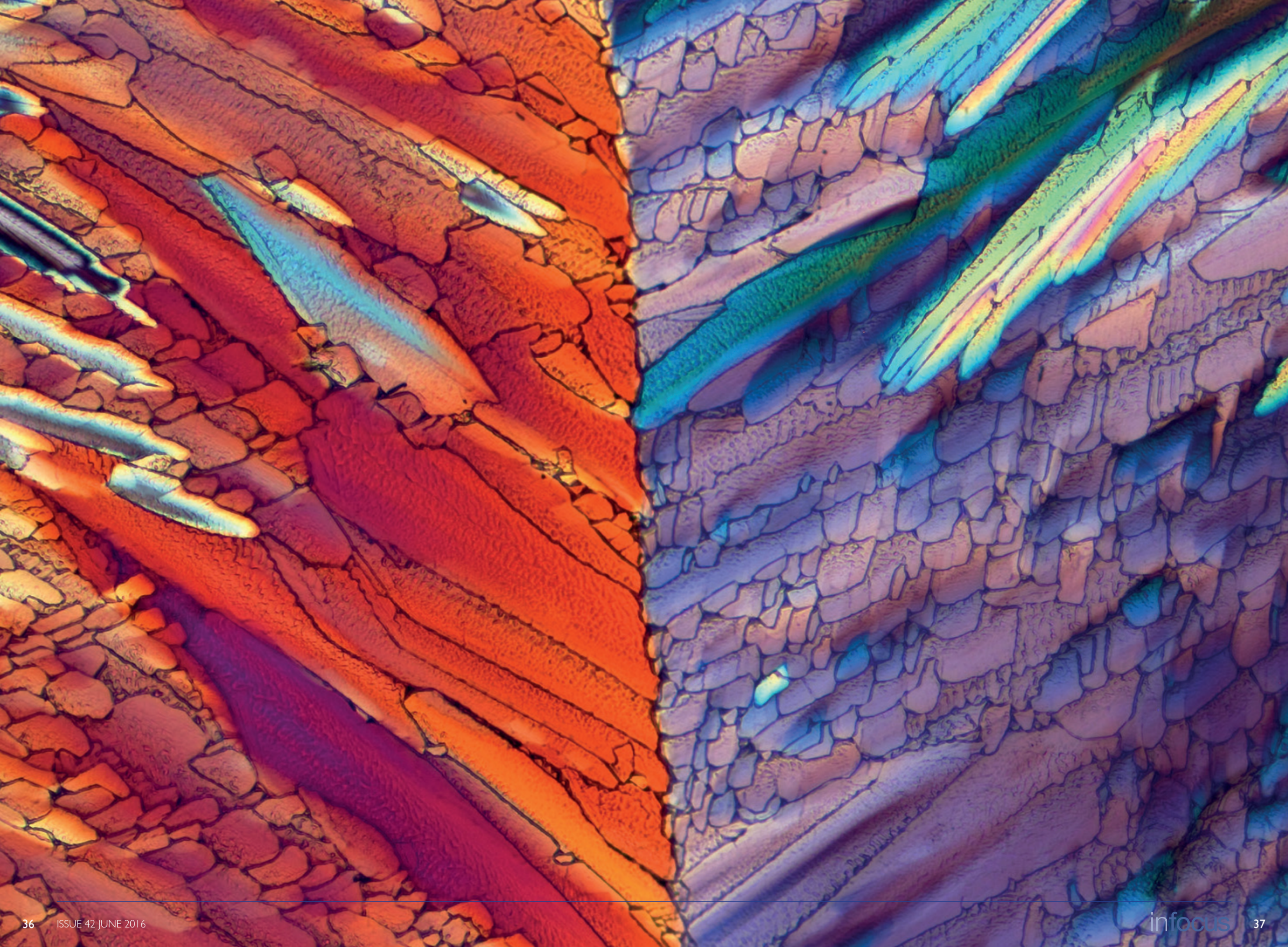


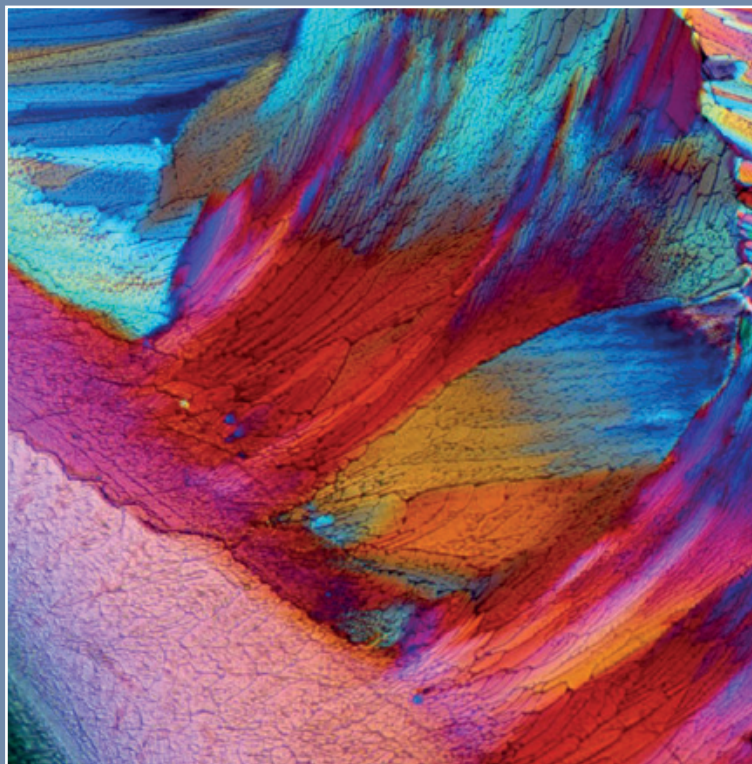




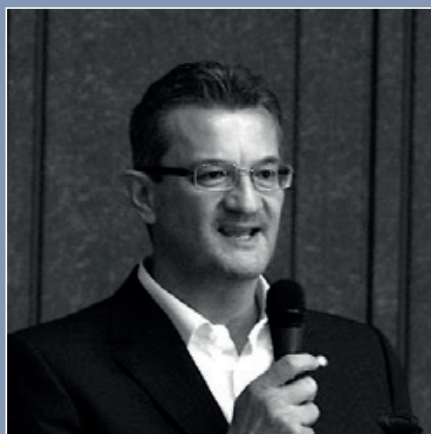








Bernardo Cesare, RMS member, is professor of Petrology at the Department of Geosciences of the University of Padova, Italy. He is the past-President of the Italian Society of Mineralogy and Petrology.



In 2009 he started the photomicrographic project "MicROCKScopica" (www.microrockscopica.org) and since then his photomicrographs of rocks have gained worldwide exposure.

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