Signac's secret

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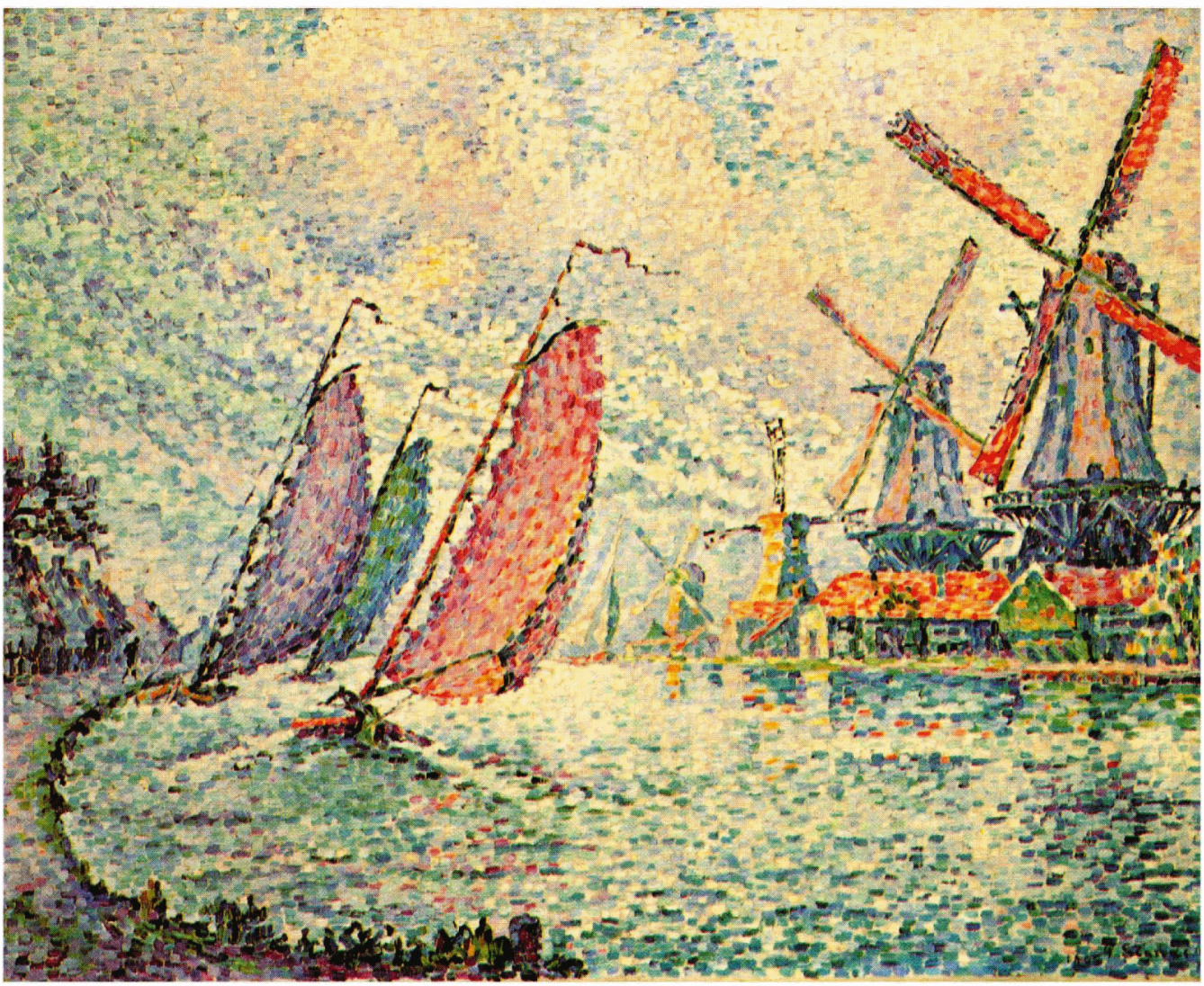
Paul Signac and Color in Neo-Impressionism. By Floyd Ratliff. *Rockefeller University Press: 1992. Pp. 317. $49.95.*

IN the course of his lifetime, Paul Signac owned 32 boats. He chose to live by the River Seine and on the coast of Brittany, and he finally settled in St Tropez. He was fascinated by water. But it was neither the surging ocean that attracted his brush, nor the calm of sheltered lakes; rather it was the dappled, intricately ruffled waters of rivers, canals and ports. And the neo-impressionist technique served well to capture the fragmented, tachistoscopically changing images of objects and lights reflected in such waters. At the hand of Signac, the dots of Seurat's pointillism became the near-rectangular *taches* of divisionism.

But Signac had a grander rationale for the vibrant mosaic of his paintings. The neo-impressionists claimed to be the first artists to apply scientific principles to painting. Signac, their spokesman, had read a translation of Ogden Rood's *Modern Chromatics* and had once called on Michel-Eugène Chevreul, the centenarian savant of French colour science. By Signac's account, the precepts of neo-impressionism were, first, to avoid the subtractive mixing of pigments on the palette and instead to gain luminosity and lustre by the "optical mixture" of adjacent *taches* of pure colour; second, to use this technique to capture the subtle variation of colour that occurs across the surface of natural objects; and third, to achieve colour harmony by contrast of complementaries, as advocated by Chevreul.

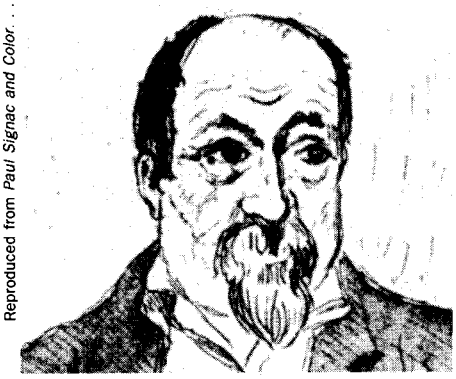
To this day, art historians are exercised by two distinct questions. How far did Signac really understand, and draw upon, the visual theory of his day? And can the visual science of our own time help us to understand the successes and shortcomings of neo-impressionism? Both questions are tackled in a new book by the distinguished visual scientist Floyd Ratliff. The book is sumptuously illustrated and includes a masterly translation by Willa Silverman of Signac's *D'Eugène Delacroix au néo-Impressionnisme*.

After a short biography of Signac, Ratliff reviews the history of colour science, leading the reader firmly through the conceptual unravelling that has characterized the field. He shows how the trichromatic nature of colour space came slowly to be seen as a property of man rather than as a property of the physical world.



Les Moulins à Overschie **(The Windmills at Overschie) by Paul Signac. 1905. Oil on canvas, 25×37¼ inches. Reproduced by permission of the Museum of Fine Arts, Springfield, Massachusetts, USA.**

Ratliff ends by offering a 'modern' account of colour theory — a reconciliation of the theory of Sir Thomas Young (*sic*) and that of Ewald Hering. Reconciliations of this kind were fashionable in textbooks 20 years ago and Ratliff shows himself to be out of date. He confounds three types of chromatic antagonism: (1) the phenomenologically opponent pairs of colours, red and green, blue and yellow; (2) complementary pairs of colours, that is, pairs that mix to form white; and (3) the colours that maximally polarize the chromatically opponent channels of the early visual system. In fact (contrary to Ratliff's definitions on page 300), pure red and pure green light mix to form yellow, not white; and the complementary of pure blue is an orange, not yellow. And no one has found cells in the primate visual system that correspond to the red–green and yellow–blue processes of Hering. The two most common types of chromatically opponent cell in the early visual system are polarized by red and by blue light and by violet and by yellow light.



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***Portrait of Paul Signac* by J. Victor (c. 1910).**

Ratliff devotes much discussion to the recognition of spatial contrast by the visual system, but curiously does not emphasize that the analysis is done on different spatial scales simultaneously. The array of retinal photoreceptors is, in fact, examined in parallel by post-receptoral channels tuned to different spatial frequencies: some subsets of cells integrate the input over relatively large retinal areas and are not sensitive to rapid variations in luminance across space, whereas other cells have the task of comparing the local image intensity at adjacent points and are insensitive to slow variation across space.

So our visual system can simultaneously show us fine detail, while averaging, say, hue or lightness over a larger area. (For blue and violet colours, chromatic aberration adds to the effect.) This 'spreading effect' or 'assimilation' is central to neo-impressionism. Signac knew that the eye would pick up the vibrant detail of his mosaic while it concurrently averaged colour over several *taches*. Ratliff writes, "It seems unlikely that the Neo-Impressionists made any deliberate use of the spreading effect, based directly on scientific knowledge of the phenomenon." Ratliff himself puts the emphasis on contrast of adjacent *taches*. I think this is simply wrong. Assimilation is central to Rood's chapter on "The small interval and gradation", which reads as a prescription for neo-impressionism. And I can find no strong basis in Signac's text for Ratliff's claim that Signac confounded optical mixture with contrast. Signac's main use of contrast is between areas larger than the individual *taches*: the contrast of oranges and blues in *Les Moulins à Overschie*, shown on the previous page, offers a captivating illustration.

By adopting *taches* of almost uniform size, the neo-impressionists imposed on themselves one severe limitation: they had less scope to delight the eye with contrast of texture. For lightness and colour are not the only surface properties extracted by the visual system. Perhaps as fundamental is texture, that is, the spatial-frequency content of the stimulus. We use texture, like lightness and colour, to identify objects, and to identify which parts of a scene belong to a common object. And the cells in the visual system that respond to specific spatial frequencies can be interpreted as texture analysers.

Only recently have visual scientists recognized that there is a contrast of texture analogous to the well-known contrast of lightness and colour (S. Klein *et al. Vision Res.* **14**, 1421; 1974). There is also 'contrast contrast': a contrasty surround will attenuate the perceived contrast of a more delicate texture (C. Chubb *et al. Proc. natn. Acad. Sci. U.S.A.* **86**, 9631; 1989). These effects were not explicit in visual textbooks of Signac's day (and are still not understood by galleries that put strongly textured gilt frames around delicately textured compositions). But what the neo-impressionists forwent was certainly understood — either explicitly or implicitly — by those impressionists who eschewed the near-uniform *taches* of Signac. A noble example is offered by Alfred Sisley's *Terrasse à Saint-Germaine: Printemps, 1875*, which is currently hanging in the special exhibition at the Royal Academy in London and in which contrasts of texture interplay with contrasts of hue and lightness.

But why should contrast — of colour, lightness or texture — be so pleasurable to the eye? To this day, visual scientists have no secure answer; and we should be ready to admit it. □

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