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Painting and Photometry

Jules Jamin and French Realism (1857)

Pierre Pinchon

In September 1855, the writer Champfleury came to the aid of Gustave Courbet, who was struggling with critics on two fronts, firstly at the Salon, where he was displaying *The Meeting* (1854, Musée Fabre, Montpellier), and secondly in The Pavilion of Realism located a stone's throw from the official displays of the Exposition universelle in which he presented canvasses like *A Burial at Ornans* (1850, Musée d'Orsay, Paris) and *The Artist's Studio* (1855, Musée d'Orsay, Paris). It was in this context that Champfleury published his letter of George Sand on Realism, not only to help the painter, but also because the leading advocate of Realism had been summoned by his adversaries to return to the ring. (1) The question that beset critical minds was not 'For or against Realism?' but rather, 'What is Realism?' For the record, Realism is, above all, an aesthetic approach supported by many critics in the early 1840s. It was a question of finding a new way of enlivening contemporary art, now that Romanticism was losing steam and that the great tradition of history painting seemed to be incapable of renewing itself. Henceforth, genre and landscape painting were to be tasked with effecting this change, thereby reconnecting with a Dutch, Spanish and French tradition going back to the 17th century based on a quest for sincerity and a study of the truth. However, it did not take long for this aesthetic reorientation to give rise to a debate, with the advent of Courbet, and to go beyond the artistic sphere, generating political resonances in a troubled period, which, in the space of three years, had witnessed a revolution, a presidential election, and a coup d'État. The situation was perfectly summed up in 1855 by the critic of the *Revue contemporaine*:

What is meant by realism? Is this the feeling of the truth in people and things, in the painting of characters and the external world? Is it a good, honest hatred of

conventions, manners, fake sensibilities, the artificial and the stilted? If so, we can only applaud it. [...] Is it that art which takes humanity and art by the throat, which attempts, with the aid of a magnifying glass, to paint every example of moral and physical ugliness [...]? Is it, in a word, the opposite of the spiritual, the ideal and the infinite? If it is, we declare all-out war on it! (2)

Attacked by the critics, Champfleury was forced to reply. If truth be told, he defended himself rather badly, eluding difficult questions, assimilating the term 'Realist' to 'Modern', before ridiculing it:

All those who have a handful of original aspirations are called Realists. We shall probably see the rise of Realist doctors, Realist chemists, Realist manufacturers, Realist historians. Mr Courbet is a Realist, I am a Realist. Critics say so, and I am happy to let them. But, to my great shame, I admit to never having studied the code containing the laws which make it possible for anyone at all to produce Realist works. (3)

It was in this context that, in 1857, the physicist, Jules Jamin, published 'L'Optique et la peinture' ('Optics and Painting') in *La Revue des deux Mondes*. (4) Appointed Professor at the École Polytechnique in 1852, he made his entrance through the door negligently left open by Champfleury to give a physics lesson to painters who either claimed to be Realists, or who had been described as such by the critics. Little known, the 1857 article is worthy of re-evaluation not only in view of the number of theoretical and historical issues in the critical debates on realism in the 1850s it reflects, but also in terms of the development of the practice and aesthetics of Impressionism in the following decade. (5)

THE PHOTOMETER AND THE BRUSH

In regard to relations between art and science in the 19th century, the article was important in three ways. Firstly, due to Jules Jamin's scientific and pedagogical skills. Jamin was an eminent scientist who had been awarded the Rumford Prize in 1858 for his work on optics, which followed in the footsteps of Fresnel and Arago. Author of a thesis entitled *La Reflexion de la lumière à la surface des métaux* ('The Reflection of Light on Metal Surfaces'), which he defended in 1847, he replaced Arago, who died in 1853, as the leading light in French optics. Jamin was also ideally placed to communicate with the artistic milieu in that he was himself an amateur painter. (6) Consequently, he was able to offer more than arid scientific descriptions to his readers; in fact, he provided a living demonstration, combining highly effective explanations of practical experiments in which he himself took up the brush in order to illustrate his approach and render it more accessible to artists.

Secondly, the article is a reminder that the development of Realism and the modern landscape was closely linked to numerous scientific discoveries made in the last third of the 19th century. Jamin emerged as one of the privileged witnesses of the dialogue that gradually developed between art

and science in Realist milieus. In 1838, he took up a post at the École Normale and discovered the Parisian intellectual milieu. According to his obituary, the young man took an interest in the artistic debates on the early developments of the Realist landscape in France at a time during which the Barbizon School was coalescing around Rousseau and Millet, and when Arago was promoting the daguerreotype at the Chamber of Deputies. To this should be added Jamin's passion for nature, another thing he had in common with the new artistic generation. Finding the time to graduate with a degree in Natural Sciences during his *agrégation* in Physics, Jamin was the ideal intermediary between the scientific milieu and an artistic scene already involved in various forms of artistic popularisation – particularly in regard to atmospheric, astronomical and meteorological phenomena –, an artistic scene which now counted numerous photographers in its ranks.

Lastly, the article's third essential quality is how it refocuses the discourse on Realism on the question of the treatment of light, or, in other words, how it adopts a point of view that was simultaneously theoretical and practical. At a time during which critical debate focused largely on the triviality of the Realist subject and tended towards a political reading of works of art, artists could only be happy at this change in tone. To hear Jamin saying that Realist painting has 'no other objective than to reproduce the effects of light and shadow' (7) was to be reminded that, long before the developments introduced by the Impressionists, the treatment of light already had a programmatic value within Realism. Beyond the well-known effects of the rising and setting of the sun dear to the hearts of the members of the Barbizon School, and beyond the rainbows of Constable and Millet, light was evidently a central question in the voluminous research carried out on the European Realist scene in the first half of the nineteenth century. One thinks above all of Granet's ecclesiastical interiors of the early 1830s in which the Capuchin friars play no more than an accessory role; of the German artist Menzel's domestic scenes and plays of light; of the British Pre-Raphaelites' representation of figures in the open-air; of Delacroix's Dieppe marine scenes, which were contemporary with Jamin's article; and of the dramatic scenes painted by Antigna, a contemporary and rival of Courbet. Consequently, it was to this heterogeneous group of artists – whose common denominator was a fascination for the various manifestations of light – that Jamin directly addressed his article. Since optics had become, in the mid-19th century, 'the most perfect of sciences and the most philosophical of doctrines', (8) his article suggested putting science into the service of art, and that science should be part of the debate on Realism. Estimating, in effect, that 'optics has a rigorous need to fulfil a duty to the Realist School', (9) the scientist left his post at the École Polytechnique to enter the Realist arena, his photometer to hand.

Although the earliest uses of photometry – namely, the measurement and quantification of the light reflected by celestial bodies – were established in the late 18th century, the first true photometer was perfected by Arago in 1839. Indeed, Jamin had worked with him. In 1857, Jamin suggested diversifying the uses to which this astronomical instrument was put and to apply it to painting.

While an article explaining the principle of the photometer had appeared as early as 1839 in the *Magasin pittoresque*, the text that appeared in the *Revue des deux Mondes* was the first to consider the instrument's potential use in fields other than astronomy and photography and to explain how it worked and how useful it could be to actors in the field of the arts. It could, for example, be used by painters to check that the levels of light intensity observed in nature were correctly mirrored onto their canvases. Working with the instrument, Jamin conducted a series of experiments thanks to which he was able to demonstrate that the eye of the artist – however sharp it might be – was

incapable of measuring precisely the differential in intensity between light and shade in an illuminated object, and that painters did not have the means to accurately take into account differentials in intensity revealed by the photometer. Pointing the instrument at various areas of the canvas and reconstituting the same scenes in the real world in order to compare results, Jamin revealed his astonishing findings and informed painters that there was always an average of 80% loss in light intensity between the object and its pictorial representation. Such is, at the end of the day, the real ambition of Jamin's article of 1857, in which he talks of science's duty in regard to the Realist School. In the final analysis, his objective was not to ensure that science was at the service of that school, but to remind its artists that the study of the real remained the prerogative of scientists:

[O]ptics finds itself in the strict necessity of fulfilling a duty vis-à-vis the Realist School, that of telling it that it is pursuing a chimera. In all times there have been men who have attempted the impossible. Alchemists have sought gold, doctors have looked for a universal remedy, scientists have pursued perpetual movement. To this list, we should now add the name of Realists. (10)

THE SCIENTIFIC LIMITS OF REALISM

In his study, although Jamin replied to the question 'What is Realism?' from his own scientific point of view, he nevertheless forgot the criteria of objectivity that characterised his field of speciality by positioning himself on the terrain of criticism in order to reply to negatively to another question: 'For or against Realism?' In spite of his interest in the natural sciences and atmospheric phenomena, there was nothing to suggest that he painted landscapes, or was interested in landscape painting. According to his obituary in 1886, Jamin preferred spending his Sundays at the Louvre rather than in Fontainebleau. Moreover, his obituary only mentions a 'highly successful portrait' by Professor Lefebvre, and a composition in the church in his home village as distinctive works making up for the lack of landscapes. (11) Furthermore, in spite of the fact that Jamin transmitted his passion for painting to his son Paul, the landscape painting gene was not part of the family's hereditary make-up. In effect, in 1879, Paul Jamin chose to embrace a career as a history painter. Specialising in pre-historic scenes and reconstructions of the life of ancient Gaul, this honourable member of the Society of French Artists trained under the iron discipline of Gustave Boulanger and Jules Lefebvre, to the great dismay of his father, who would have preferred that he studied at the École Polytechnique, even if Paul seems to have followed his father's advice and studied the intensity of light (*Le Brenn et sa part de butin*, 1893, Musée des beaux-arts, La Rochelle).

According to the 1857 article, Jamin was not a great fan of contemporary painting, even though the publication was aimed at modern artists, or, in other words, Realists. Indeed, this paradox is the most interesting thing about the study. As he reminds the reader in his introduction, the article is not aimed at history painters who followed in the footsteps of Raphael, Correggio and Murillo, all of whom are used as examples in his argument. According to Jamin, history painters need their imagination and their poetic sense to accomplish their elevated task in the field of the religious and the translation of human passions. They should not, therefore, have to 'conform to the necessities of precision demanded of the exact sciences'. (13) The scientist drew a clear distinction between an

intellectual, Idealist style of painting – for the soul –, and a visual, retinal style of painting unimaginatively subject to ‘the rules of physics’, (14) a style of painting that he did not hesitate to denigrate when he wrote: ‘the truth sought by artists [history painters] is not the vulgar truth of the eyes, it is the reality of thoughts and feelings’. (15) Published two years after the Exposition universelle of 1855, Jamin’s article still bears the stigmata of the exhibition organised by Courbet in his Pavilion of Realism when he wrote of the Realists that:

One has even seen talented men who, disdaining the moral sublimities, display their indifference to the choice of subjects to condemn themselves exclusively to the task, more thankless than useful, of pursuing reality everywhere it is accessible, whatever, indeed, the conditions of ugliness and beauty that it affects.
(16)

While he did not appreciate Realist works in which ‘human figures only appear as often ill-treated accessories’ (17), Jamin remained prudent and did not fully enter the debate that had animated critics since the beginning of the 1850s. He was careful never to make explicit reference to Courbet, Antigna, Millet, Rousseau, or the landscape painters of Fontainebleau anywhere in the article. Refusing to take his examples from the Salon or from contemporary exhibitions, Jamin preferred to observe paintings that adorned the Louvre and the Musée du Luxembourg focusing exclusively on landscapes and genre scenes by deceased artists like Drölling, who died in 1817, and artists who had recently passed away, for example Granet, who died in 1849.

Destined to a brilliant career and already aiming to become a member of the Institute, a goal that he would achieve in 1868, the physicist declined to venture onto the now political terrain of Pictorial Realism – in the same year of 1857, the Minister of State, Achille Fould, attacked Realism in his closing speech at the Salon, – instead choosing to focus exclusively on Realist works from the first third of the 19th century to demonstrate his ideas. Jamin took no risks: Drölling was long dead, and his son, a member of the Institute, was no longer capable of taking umbrage, since he had passed away in 1851. Granet, another Academician who had died recently, became the scientist’s favourite target. Writing about the Aix-en-Provence artist’s supposed successes, Jamin decried him as a painter whom people ‘never tired of admiring’, (18) who had, it was said, had been responsible for ‘a kind of revolution’ (19) by producing ‘paintings that, indeed, had little by way of variation’. (20) As well as playing the role of critic, Jamin did not hesitate to express his scientific views. Using his photometer to measure scenes analogous to those painted by Granet, he demonstrated that the painter’s treatment of light, so often the object of praise on account of its Realism, was entirely illusory, and that the artist did not merit such commendation. (21) Jamin was more than willing to take the step from scientist to critic.

However, he recognised that modern artists had made considerable progress in their quest for the truth. An example was provided by Alexandre-Gabriel Decamps. (22) Recently honoured by the French government, which had granted him a retrospective at the Exposition universelle in 1855, Decamps, like Delacroix, Ingres and Delaroche, continued to enjoy great prestige amongst members of the public and critics alike.

Like Baudelaire, Théophile de Gautier, and the Goncourt brothers, who admired Decamps' use of matter and light, Jamin was also an admirer of this painter, who was known for his Orientalist and Barbizon subjects. Nevertheless, this is somewhat troubling, given that Decamps' approach to light had no scientific basis, unlike contemporary landscape artists, who displayed a pronounced interest in meteorology and photography, and Delacroix, who was fascinated by the science of colours. In the conclusion to his article, Jamin referred to Decamps, not in opposition to Delacroix, as was the case of the critics of the time, but as a counter-example to Courbet, whom he considered to be to be the incarnation of Realism. After a rigorous scientific demonstration, Jamin's conclusion is firm and sententious:

It [Realism/Courbet] was less true than Decamps, who was at once more modest and more able. It was not worthwhile to so openly display such a great pretention which is so little justified, and to take as a title the one which, of all names, is the most impossible to justify. No, painting is not truth, Realism is an objective that is not to be sought, because it is impossible to attain. There is another objective with which we must content ourselves, but which, being more philosophical and more moral, places painting higher in our esteem than would scientific exactitude, if it were attainable. I deem myself lucky to have arrived at this conclusion, and only to have introduced physics into these questions to have it play a role that we did not expect from it, that of recalling to painting, which tends to forget it, the idea of spirituality. (23)

AN ARGUMENT IN FAVOUR OF THE IMPRESSIONIST EYE

As precise as it was radical, Jamin's conclusion did not have the expected effect amongst the ranks of the Realists and the new generation of painters. In discrediting – with the aid of the photometer – painters' ability to imitate nature faithfully, and by demonstrating the enormous gap that existed between light in nature and in art, the 1857 article played not only an important role in spreading scientific theories in the artistic milieu, but also in the elaboration and development of the Impressionist aesthetic in the late 1850s and in the 1860s.

The choice of the publication in which the article appeared was by no means anodyne. Through the *Revue des deux Mondes*, Jamin intended to present his scientific views to a wider audience. He knew that he was going to reach the artistic readership directly. An important platform for Delacroix, who published six articles in the journal between 1837 and 1861, the *Revue des deux Mondes* took a keen interest in the Fine Arts, concentrating on the Salons, and frequently publishing studies by the critic, Gustave Planche, an authoritative figure there. Indeed, the journal was an ideal terrain for a meeting between art and science from the perspective of popularisation.

In this regard, I should, once again, mention Jamin's talent as a writer, as well as his pedagogical qualities. While scientific treatises often put off beginners due to their arid prose and imposing length – Chevreul's founding work, *On the Law of Simultaneous Contrast of Colours*, published in 1839, was almost 700 pages long –, Jamin's article stood out for its brevity and the clarity of his writing style. (24) Furthermore, the article was directly addressed to painters and designed to appeal

to their interests, presenting practical experiments in the pictorial field, which were evidently much more accessible than a long scientific demonstration.

Published during a period in which an artist like Corot was taking an interest in the glass-print technique (25), Jamin's article appeared at a foundational moment in relations between art and science in the 19th century. While painters and photographers now shared the Barbizon approach, Jamin was the first French scientist to advocate a rapprochement between the scientific and artistic spheres:

[O]ne imitates appearances without wanting to explain them, the other attempts to analyse effects without seeking to define them; but, in the course of their research, they find common ground; they study the same subjects, they both examine the details of the same scenes with the same attention and the same care, but with different intentions. As a result, their observations are shared, and it is legitimate to think that the science of one group could be useful to the practice of the others [...]. (26)

Foreshadowing the interest of Seurat, Pissarro and Van Gogh in the studies of Chevreul and Helmholtz in the fields of the science of colours and physiological optics, the publication is all the more interesting in that it occupies a very precocious place in the chronology of the relations between art and optics in the 19th century in France. From a historiographical point of view, the study that appeared in the *Revue des deux Mondes* played an important role as a link between the publication of the *Manuel d'optique expérimentale à l'usage des artistes et des physiciens* ('Manual of Experimental Optics for the Use of Artists and Physicists') by Charles Bourgeois and later, but decisive, publications like *L'Optique et les Arts* ('Optics and the Arts') by Auguste Laugel (1869) and, above all, the French translation of Brücke's *Scientific Principles* (1878), which appeared alongside a conference paper delivered by Helmholtz entitled, 'Optics and Painting', like Jamin's article of twenty years earlier. (27) While the research carried out by Hermann von Helmholtz on physiological optics only became available to French readers in 1878, Jules Jamin's already agreed with the German scientist. In effect, the two scientists concurred that it was enough to respect the gap with light intensity found in nature by reproducing on the canvas a gap in intensity of the same order:

I shall continue with the example of a ray of sunlight striking a body, throwing a shadow. I measured the relationship of two levels of brightness; I examined it in the summer or in the winter, at different hours of the day, in good and bad weather, and in very different circumstances. I found, as you can imagine, extremely different results; but [...] we can see that this relationship never goes beyond certain limits, namely between 10 and 20 [...]. The extreme variability of this relationship leaves, as we can see, a wide latitude to painting, of which we ask one thing only, namely to stay between the same extreme values, 10 and 20. (28)

In taking as an example a human figure subject to the diversity of natural light, Jamin was doing no more than anticipate the preoccupations of the new generation of painters led by Monet, Bazille and Renoir who, following Courbet, intended to position the study of the human figure in the open air as one of the major issues of modern painting.

Published at a time in which these young men were coming to Paris to learn painting, Jamin's article proved scientifically that vision could not be objective and that the principle of the imitation of nature had, consequently, to be called into question. In sum, Jamin provided the new generation with a formidable argument in favour of the fight against conventions in painting, in the same period in which Monet was beginning to develop his style, embracing the subjectivity of vision. Indeed, at the end of his life, Monet wrote:

When you go out and paint, try to forget the objects before you, a tree, a house, a field, or something else. Only think: here's a little square of blue, an oblong splash of pink, a dash of yellow, and paint them just as you see them so that your naïve impression comes to the fore. (29)

This passage should be compared with another passage by Jamin, published at the dawn of Monet's career:

If it were possible to delete objects, while at the same time the movement of light that they determined continued to exist, if light rays went on entering the eye after that deletion [...] the image would continue to form without undergoing the slightest alteration. It would be no more than an illusion, but it would be complete; it would be no more than phantasmagoria, but it would have all the characteristics of reality. (30)

Although Monet mistrusted theory, it should be remembered 'that no eye exists in a wild state'. (31) As established by the cognitive sciences, there is no purely visual perception, because it is always subject to the cognitive phenomenon. As Georges Roque pointed out, it is, therefore, vain to ask oneself "if the Impressionists formulated explicit 'theories' or not; it is enough to say that the scientific knowledge that was part of their baggage, since the Barbizon School, informed their perception, and, therefore, their way of painting', (32) thanks, notably, to publications like Jamin's which occupied a vacant place in the field of artistic literature between 1857 and 1869, prior to the publications of Brücke, Helmholtz, and Charles Blanc.

Although Monet, Renoir and Pissarro and their Barbizon elders perhaps never laid claim to a direct relationship with science, the existence of that relationship is nevertheless verified in the artistic literature produced by critics and collectors of Impressionism like Théodore Duret. In 1867,

dedicating a substantial number of pages to Théodore Rousseau, whom he recognised as one of France's leading landscape painters, Duret rendered homage to the fight that the Realist painter was constantly obliged to have with nature, even when he was forced to admit defeat:

Whatever the power of the artist, the limited means of the palette only allow him to reproduce nature's various aspects within restricted limits. The artist therefore quickly encounters an extreme point that it is impossible for him to go beyond, a point at which it becomes impossible for him to triumph over the material obstacles that the imperfection of his means oppose to the faithful reproduction of certain aspects of the external world. What is more difficult, or even impossible to depict on a canvas than the sun and plays of light? How powerless is the painter to reproduce the crimson, slightly pink, and purplish evening and morning skies, and those golden beams that stretch out above the horizon at the setting of the sun? Thus, when Rousseau, in the presence of these great spectacles, wages, so to speak, a constant battle with nature to steal its most striking light effects, surely it is not surprising that he is, on occasion, defeated [...]. (33)

Once again, it seems certain that Jamin had been understood, he who had, ten years earlier, written about how painting could not rival the real: 'painting is not, as one often supposes, a reproduction of nature, but an admitted fiction, whose procedures are conventional, and which produces works without physical reality [...].'(34) By condemning both conventional paintings and the attempts of the Realist School to approach the Real as closely as possible, Jamin was trying to put science at the service of art in order ensure that art did not get lost on dangerous roads. But perhaps in spite of his intentions, these fruitful observations opened another road for Monet, that of the dematerialisation of the object to the benefit of the exclusive representation of the intensity of light, even if, in so doing, he abandoned the field of objectivity to the exclusive benefit of subjectivity.

NOTES

1. Champfleury, 'Du réalisme. Lettre à Madame Sand', in *L'Artiste*, v. XVI, September 2, 1855, pp. 1-5.
2. Armand de Pontmartin, 'Le roman en 1855', in *La Revue contemporaine*, v. XX, June 1855, p. 249.
3. Champfleury, op. cit., p. 2.
4. Jules Jamin, 'L'optique et la peinture', in *La Revue des deux Mondes*, v. VII, February 1857, (first fortnight), pp. 624-642.
5. See Aaron Sheon, 'French Art and Science in the Mid-Nineteenth Century: Some Points of Contact', *Art Quarterly*, No. 34, Winter 1971, pp. 436-440; and Georges Roque, *Art et sciences de la couleur*, Paris, Gallimard, coll. 'Tel', 2009 (1st edition, 1997), pp. 456-458.
6. Anonymous, 'Jules Jamin', *La Nature*, No. 665, February 27, 1886.

7. Jules Jamin, 'L'optique et la peinture', op. cit., p. 627.
8. Ibid., p. 624.
9. Ibid., p. 642.
10. Ibid.
11. 'Jules Jamin', op. cit.: 'He did a very good portrait of Lefebvre; his family has a number of his canvases, and the church in Termes possesses one of his paintings'.
12. Jules Jamin, 'L'optique et la peinture', op. cit., p. 626.
13. Ibid.
14. Ibid.
15. Ibid.
16. Ibid., p. 627.
17. Ibid., p. 626.
18. Ibid., p. 637.
19. Ibid.
20. Ibid.
21. Ibid.: 'A dark, vaulted room, cloister, church or basement, a window at the back through which one can see the sky, and which throws light on the room, well-lit characters, large shadows, this is Granet's art [...]. I have studied every one of his paintings; I have, in particular, compared the brightness of the sky with the window frames. The sky is between four and six times brighter than the window frame. Anxious to measure the truth of those paintings, I sought out analogous scenes; I chose an office illuminated by a central window [...] and, placing myself in front of the window with my photometer, I discovered that the sky was four hundred times brighter than the window frames. The truth of Granet's paintings is, therefore, entirely illusory'.
22. Ibid. pp. 636-637: 'However, not all landscape artists are deserving, to the same degree, of the reproach I address them; the artists of the modern school have made enormous progress in terms of precision; everyone has noticed that their paintings contain darker shadows and stronger light, and that there are, for example, paintings by Decamps in which the effect of the sun measured by the photometer is encompassed within the limits of natural truth'.
23. Ibid., p. 642.
24. On this question, see Georges Roque, op. cit., pp. 213-216.
25. See the exhibition catalogue, *Gravure ou photographie ? Une curiosité artistique: le cliché-verre*, Arras/Musée des Beaux-Arts/Gourcuff Gradenigo, 2007.
26. Jules Jamin, 'L'optique et la peinture', op. cit., p. 625.

27. See Georges Roque, op. cit., pp. 457-458.
28. Jules Jamin, 'L'optique et la peinture', op. cit., p. 636.
29. Claude Monet quoted in Gustave Geffroy, *Monet, sa vie, son oeuvre*, Paris, Macula, 1980 [1924], p. 460.
30. Jules Jamin, 'L'optique et la peinture', op. cit., p. 631.
31. Georges Roque, op. cit., p. 293.
32. Ibid.
33. Théodore Duret, *Les Peintres français en 1867*, Paris, Dentu, 1867, p. 34.
34. Jules Jamin, 'L'optique et la peinture', op. cit., pp. 641-642.

ILLUSTRATIONS

1. Eugène Pirou, *Portrait de Jules Jamin, membre de l'Institut de France*, c. 1884-1886, Woodburytype, Bibliothèque de l'Institut, Paris © RMN-Grand Palais (Institut de France)/Mathieu Rabeau.
2. Bartolomé Esteban Murillo, *The Holy Family, or The Virgin of Seville*, 1665-1670, Musée du Louvre, Paris © RMN-Grand Palais (Musée du Louvre)/Hervé Lewandowski.
3. Martin Drölling, *Interior of a Kitchen*, 1815, Musée du Louvre, Paris © RMN-Grand Palais (Musée du Louvre)/Philippe Fuzeau.
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5. Alexandre Gabriel Decamps, *Une rue à Smyrne*, Musée du Louvre, Paris © RMN-Grand Palais (Musée du Louvre)/Franck Raux.
6. Auguste Renoir, *Study. Torso Sunlight Effect*, c. 1875-1876, Musée d'Orsay, Paris © RMN-Grand Palais (Musée d'Orsay)/Hervé Lewandowski.
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