PAUL COLLINS

THE MAN WITH X-RAY EYES

Nineteen hundred and three was a good year for radiation.

After Wilhelm Roentgen's discovery of X-rays in 1895, each year for the next decade brought news from Germany, the United States, Britain, and France of the discovery of more forms of radiation — alpha rays, beta rays, radio waves, gamma rays. Labs quickly stocked up on vacuum tubes and Ruhmkorff induction coils; piles of radioactive radium and uranium powders were left haphazardly lying about on the desks. Elusive infrared and ultraviolet radiation became laboratory playthings, and dazzling arguments arose over the dual wave and particle manifestations of radiation. Einstein capped it all off by publishing his theory of relativity and the quantum theory of radiation.

People had scarcely any idea what the long-term effect of all this radiation was, but they did know that it was new and exciting. Advertisers leaped on it, and for a while at the turn of the century, trendy consumers could buy Radium Soap, Radium Flour, and Radium Boot Polish. Radon sodas and digestives in particular were all the rage—at least, they were until members of high society started keeling over, their bodies racked and pitted with massive overdoses of radiation.

LEADING THE SCIENTIFIC charge was Professor Rene Blondlot, the head of the physics department at the University of Nancy, in the northeast of France. Blondlot was a brilliant scientist, famed for his discovery that electricity moved through a wire at close to the speed of light. He'd also devised ingenious experiments to examine the polarization and velocity of radio waves and X-rays.

It was the latter that was occupying his attention in the winter of 1903. No one was sure if X-rays were a stream of particles, like gamma rays, or if they were waves, like visible light and radio. To test this out, Blondlot fired X-rays into a charged electric field and placed a detector off to the side of the path of the X-rays. If the X-rays were waves, the field would polarize them—that is, shift their path and send them through the detector, causing an electric spark in it to brighten. And that's just what they did—Blondlot proved, quite correctly, that X-rays are actually waves.

Then he tried a further experiment—using the cathode tube to send X-rays through a quartz prism. It was needless, really, since it had already been shown that quartz prisms didn't deflect X-rays. But as the X-rays hit the prism, Blondlot noticed something from the corner of his eye: the detector's spark got brighter.

This wasn't supposed to happen. Blondlot tried it again, and again it got brighter—almost imperceptibly brighter, but brighter nonetheless. It couldn't be the X-rays doing it, so it had to be something else. And then it dawned on him.

He had discovered a new form of radiation.

BLONDLOT UNVEILED HIS discovery to the world in a paper titled "On a New Species of Light," in the March 23, 1903, issue oiComptes Rendus, the proceedings of the Academies des Sciences. News of his discovery flashed to physics and medical departments around the world.

The radiation was to be called N-rays, after Blondlot's beloved town of Nancy. Subsequent experiments in March and April 1903 by Blondlot showed that these N-rays exhibited some very curious properties. They'd pass straight through materials that would block visible light—wood, aluminum, black paper. On the other hand, some materials that visible light could pass through, like water and rock salt, proved impenetrable to N-rays. And a prism-shaped piece of aluminum, it turned out, would bend and spread N-rays just as a glass prism bent visible light.

A burgeoning array of testing apparatus rilled up Blondlot's university lab. He installed phosphorescent screens of calcium sulfide; in a darkened room, they faintly lit up when struck by N-rays. He also built lightproof cardboard boxes over photographic plates; when N-rays were fired through the box, their effect on an electric spark or a gas flame inside the box was visible on the photographic plate. Soak another cardboard box with water, though, and the N-rays couldn't get in—and the wet box's photographic plate, when developed, showed just this result.

As the year passed, Blondlot and his assistants at the University of Nancy racked up one discovery after another. He found that the sun emits N-rays, although "light clouds passing over the sun considerably diminish their action." Various other kinds of electric lamps also emitted the rays, although a Bunsen burner did not. A lens-shaped chunk of aluminum or quartz could focus N-rays, much as holding a glass lens out in the sunlight will produce an intensely bright spot when held the right distance off the ground.

One didn't need fancy cathode tubes and platinum filaments to produce N-rays, either, as Blondlot told his French colleagues in a November 9, 1903, paper in the Comptes Rendus. Ordinary objects warming in the sunlight absorbed and then radiated N-rays:

Pebbles picked up at about four o'clock p.m., in a yard where they had been exposed to the sun, spontaneously emitted "N" rays; bringing them near a small mass of phosphorescent sulfide was sufficient to increase its luminosity. Fragments of calcareous stone, brick, etc., picked up in the same yard, produced analogous results.

Two weeks later, Blondlot revealed that salt water also had storage properties. That meant that the entire planet—mostly covered with salt water, and in the glare of the powerful radiation of a nearby star—was in effect a giant N-ray battery, storing and then shining back the sun's N-radiation.

You didn't even need a sunny day to get N-rays. Any object with molecules under compression—like the tempered steel in a knife or chisel, a watchspring as it was wound up, or a bamboo cane as it was bent—would emit N-rays. And the radiation scarcely diminished over time. Blondlot tested a new knife, and then another knife from a local archaeological dig of Roman ruins. They had equally strong N-rays.

Spurred by Blondlot's accelerating pace of discoveries, scientists throughout France enthusiastically set up cathode tubes and calcium sulfide screens to experiment with N-rays. Physicists in London traipsed down to Charing Cross to buy Nernst lamps from the storefront of the Electrical Company, as these lamps were known to be a rich source of N-rays. These scientists were well advised to follow Blondlot's instructions scrupulously: to acclimate one's pupils to see the effect of N-rays on a dimly phosphorescent screen, one had to sit in a darkened room for at least half an hour beforehand. In any case, the effects of N-rays were not always immediately obvious, for sometimes they took several minutes to be visible to the human eye.

But most important, one had to view the screen off-axis—that is, with peripheral vision. And even then, Blondlot warned, some scientists simply wouldn't have strong enough vision to see it:

The aptitude for catching small variations in luminous intensity is very different in different persons; some see from the outset, and without any difficulty. . . . For others, these phenomena lie almost at the limit of what they are able to discern, and it is only after a certain amount of practice that they succeed in catching them easily, and in observing them with complete certainty.

Blondlot was asking his colleagues to push at the very limits of human visual perception in their observations, and sure enough, a number of physicists—particularly elderly ones like Lord Kelvin and Robert Crooke—found themselves frustrated. But many other scientists did have sharp enough vision, and by the beginning of 1904 their experimental results were pouring into science journals.

YOU ARE GLOWING with N-radiation as you read these words. In January 1904 the French professor of medical physics Augustin Charpentier discovered that the human body emits N-rays, particularly where there is muscle under compression, or where there are certain kinds of nervous tissue. Stand behind a big enough phosphorescent screen in a dark room and flex your arms, and a faint outline of your body would appear, with slightly brighter spots around your biceps and the Broca's Area of the brain.

Charpentier's results were quickly confirmed in England by Drs. Hugh Walsham and Leslie Miller. They invited the editors of the medical journal The Lancet to observe the brightening of a wiggling thumb under the screen; the editors were duly impressed by the results. "There would no longer appear to be any doubt," they wrote in the February 20, 1904, issue, "that rays are given off by active muscles and nerves." Not that every Lancet writer was possessed of such indisputable genius; an adjacent column from an aptly named Dr. White made the curious claim that "among the North American Indians insanity is of rare occurrence . . . because they live an easygoing outdoor life free from care and worry for the future and therefore free from mental overstrain."

Still, Professor Charpentier's work had raised an interesting idea— that an entire unseen world of the human nervous system would now be visible with N-ray technology. "This effect," marveled the journal Nature, "may prove of the greatest importance in the case of nerves." What X-rays were just starting to do for the observation of organs and bones, N-rays could now do for brain matter and muscles. They could even help diagnose disease; in March 1904, Gilbert Ballet of the French Academy discovered that specific ailments like spastic paraplegia produced unique N-ray patterns. Meanwhile, a neurologist in Edinburgh pondered the notion of detecting brain tumors through N-ray patterns made by the brain. The miraculous diagnostic tool of brain scans, a concept that had been beyond the range of thinkable thoughts before, now opened itself to those who could develop this technology.

It made sense that medical doctors would be the most interested in the discovery of N-rays, for at the turn of the century doctors were bombarding hapless patients with every variety of radiation available; as soon as a new wavelength was discovered, doctors built lamps to generate it, and then joyfully zapped gouty joints, tubercular lungs, syphilitic brain tissue, and anything else that happened to venture into their waiting rooms. It was known that ultraviolet light helped clear up smallpox pustules, that infrared could soothe injured muscles, and that gamma radiation might shrink tumors ... so why not try N-rays?

MANY ENGLISH SCIENTISTS, though, were lagging dreadfully behind their French colleagues. The journal Nature received letters and articles almost every month in 1904 from scientists complaining that no matter how hard they squinted, they simply couldn't catch a glimpse of N-rays hitting their calcium sulfide screens. A few even sourly suggested that N-rays weren't put out by the body at all; rather, it was body heat that made the screen fluoresce. S. G. Brown of London noted in the January 28 issue:

About three months ago, I independently discovered that a feebly luminous phosphorescent zinc sulfide screen when brought near the body increased in brightness. . . . [Perhaps] heat was the cause of the phenomenon. Further trials showed this to be the case; by laying the back of the screen against a fluted jar filled with warm water the zinc sulfide would brighten up.

A month later, London physicist A. A. Swinton wrote a long letter to Nature about his own experiments—he found that a warm coin could produce the same effect. Put your foot near the screen, and it might fluoresce with N-rays, but when you took your foot out of your boot and just left the still-warm boot behind, the screen still fluoresced. What the French were seeing on their screens, Swinton warned, was just heat. The fact that N-rays only gradually appeared on the screen was especially damning to Swinton—after all, he said, most thermal effects also take a while to appear.

Even so, these writers were careful not to dismiss N-rays out of hand. "One can scarcely believe that a man of science of M. Blondlot's antecedents and experiences can have deceived himself," Swinton vouched. And the argument over heat quieted down a little when Hugh Walsham and Leslie Miller, writing again in The Lancet, found that heat did indeed affect the screens—but that after you insulated the screens from heat, they still glowed in the presence of muscle contractions and nerve activity.

Wishing to settle the matter once and for all, the Lancet editors tried it out in their offices one day that February. They reported, "By simply placing a speck of recently excited calcium sulfide on a thick book—such as, for example, the Medical Directory—a distinct increase in the glow is obvious when the muscles of the hand or leg are contracted underneath."

BACK IN FRANCE, N-rays were consuming Blondlot's life, and throughout 1904 he was publishing papers in Comptes Rendus at a staggering rate. Every month saw a new paper, complete with diagrams and photographic plates. Nor was he alone: in the first half of 1904, Comptes Rendus published fifty-four papers on N-rays. During that same period, it published only three papers on X-rays. And the import of the discoveries was no longer about the basic nature of the rays themselves—that had been well established. Now scientists were pushing into the effect of the rays on human subjects, with Blondlot himself as one willing subject.

Closing the shutters of his laboratory one cold day, Blondlot sat in the darkness and waited for his eyes to acclimate. Even so, he could scarcely see his hands in front of his face, nor the clock on his lab's wall.

He exposed his eyes to a chunk of N-radioactive material.

Slowly, and to his amazement, his hands became visible in front of him. The clock on the wall became clearer: at first he saw the clock face turning whiter. But the clock was a full twelve feet away—he couldn't possibly see it from here. Then he saw its circular outline emerge from the darkness. And then—this in near pitch darkness— he could see the hands of the clock.

OTHERS RUSHED TO experiment with the effect of N-rays on the human senses, and published reports verified Blondlot's results. Not only did vision sharpen with exposure to N-rays, so did all the other senses. Professor Charpentier continued his experiments well into the spring, beaming N-rays at humans and at the spinal columns of unfortunate dogs and frogs. He found that exposing the tongue, the nasal membrane, and the inner ear to radioactive material made them more acutely sensitive. Firing N-rays at the frontal lobe of the brain also did the trick—a beam of N-rays directed at the glabella or the bregma, for example, would make a subject suddenly aware of hitherto indiscernible smells. Irradiate the seventh cervical vertebra, and you could make the pupils of the eye contract.

Another physicist, Jean Becquerel, found that the drug digitalis emitted N-rays, but only in the presence of a beating heart. Something about the heart caused the digitalis solution to radiate. Anesthetic drugs like chloroform, on the other hand, could cause organic and inorganic materials alike to stop emitting N-rays. With a bit of ether, you could "anesthetize" a chunk of metal to make it stop emitting N-rays. So the secret of the efficacy of drugs, some speculated, might have little to do with the chemical content—it lay in their tendency to accumulate in certain parts of the body, where they would then irradiate tissue with N-rays, or cause the tissues to stop radiating.

But others were simply not convinced. C. C. Schenk, a Canadian physicist at McGill University, archly commented in Nature about Blondlot's ability to make exacting wavelength measurements "with a radiation so feeble that no one outside of France has been able to detect it at all." Others wondered aloud whether France was in the grip of a spell of self-hypnosis. Furthermore, not all of Blondlot's supporters were entirely reputable. A variety of cranks had written Blondlot and others in 1904, claiming that they had discovered N-rays years before, and loony experiments with unfortunate live subjects abounded.

Indeed, just about the only place you wouldn't find N-rays was in a dead body. Although Blondlot found that the eye of an ox could store N-rays days after the ox had been butchered, experiments by Charpentier had shown that long-dead tissue did not store or give off N-rays. This gave one Lancet correspondent a way of disproving the theory that N-ray results were being caused by nothing but body heat. When not bathing live patients in N-rays at his office in Durham, Dr. J. Stetson Hooker also found a good use for N-rays on a dead patient:

I had some months ago the opportunity of trying to pass the rays through the forearm of a deceased patient some time after all the natural warmth had passed off. . . . Increased luminosity on the screen was soon apparent to myself and two eye-witnesses. Surely any heat rays would have been stopped on any attempt to pass them through this particularly cold stratum.

A reasonable-sounding argument. But then Dr. Hooker goes on to describe some further experiments on rays given off by humans:

I have conducted during odd moments of the last three years some 300 experiments to test this question of the human-ray spectrum and the extraordinary unanimity of the results is astounding. . . . Rays emanating from a very passionate man have a deep red hue . . . the ambitious man emits orange rays; the deep thinker, deep blue; the lover of art and refined surroundings, yellow; the anxious, depressed person, grey; the one who leads a low debased life throws off muddy-brown rays.

It is hard to know whether Hooker had actually seen rays emanating from his patients. He does appear, however, to have discovered the precepts governing the Mood Ring.

Faced with a wave of evidence coming in from respected scientists and crackpots alike, John Butler Baker, writing from the Cavendish Laboratory, simply threw up his hands. "I am at a loss to find any other explanation of M. Blondlot's results," he said shrugging, "than that he has come across a radiation to which some men are blind and others not so."

The problem, Blondlot patiently reminded his colleagues, was that their eyes had to be sensitive and acclimated to the dark, and they had to be viewing the rays from precisely the correct angle—anyone standing off-axis to the rays' plane of polarization might see nothing at all:

Only the observer placed exactly in front of [i.e., near] the sensitive screen perceives the effect of these rays. It also shows how illusory it would be to try to make an audience witness these experiments: the effects perceived by different persons, depending as they do on their position with regard to the screen, would certainly be contradictory or imperceptible.

Even if a few foreigners disagreed, any doubts in France about the importance of Blondlot's discoveries were silenced when he received a letter from the Academies des Sciences on August 26, 1904. He had been awarded the Lecomte Prize, with a purse of fifty thousand francs and fame as his country's greatest physicist. There was only one prize left to secure: the Nobel Prize in Physics. Only three years old at this point, it had always been won by discoverers of radiation—Wilhelm Roentgen, Henri Becquerel, and the Curies. Now it might be Blondlot's turn.

OVER IN ENGLAND, things were looking glum. It was a September day in Cambridge, and a knot of physicists gathered in a corner of a meeting of the British Association for the Advancement of Science. None of them had been able to find N-rays in their experiments, and the news of Blondlot's award was weighing heavily upon them.

Professor Rubens, visiting from Berlin, was especially exasperated. Kaiser Wilhelm had ordered a command performance of N-rays, and after two weeks Rubens had to call the Kaiser in utter humiliation and admit that he simply couldn't do it.

Rubens's gaze fell upon another visitor to the meeting—Robert W. Wood, who was spending the summer off from his usual post heading the physics department at Johns Hopkins University. Wood was a mischievous fellow—he'd gone on a joyride on the Trans-Siberian Railway while it was still being built, had swooped about in a glider before its design was remotely safe to life and limb, and had written a loony spoof of nature manuals titled How to Tell the Birds from the Flowers. He also happened to be a brilliant physicist.

"Professor Wood," Rubens said pleasantly, "will you not go to Nancy immediately and test the experiments that are going on there?"

Wood demurred. Rubens had been the most afflicted by the N-ray discoveries, after all, so maybe he should go. But Rubens persisted—it would look too impolite if he, who had been very graciously answered by Blondlot in his correspondence, were then to throw cold water on the fellow. An artless colonial like Wood would hardly have anything to lose.

"Besides," Rubens added helpfully, "you are an American, and you Americans can do anything."

WOOD ARRIVED AT Blondlot's laboratory in the evening of September 21. Blondlot was happy to see him; not too many foreigners made the trek hundreds of miles out of Paris to the University of Nancy, and the good professor was always delighted to show off his latest N-ray results.

Blondlot didn't speak English, though, so he and Wood decided to converse in the international language of physics—German. This left Blondlot free to make confidential asides to his lab assistant in French, although Wood secretly knew enough French to make out the gist of their conversation.

The evening commenced with a simple demonstration. Blondlot painted some circles in luminescent paint on a card, and then turned down the gaslights in his lab. With the circles glowing faintly in the dark, Blondlot irradiated the glowing card with a stream of N-rays.

Do you see the change in luminosity? he asked in the darkness.

Wood couldn't see it.

It proves nothing, Blondlot insisted. Your eyes are not sensitive enough yet.

They had reached an impasse of sorts, and Wood decided that even if his eyes weren't sensitive enough to prove the existence of N-rays, then surely Professor Blondlot's were. Standing in the darkness of the lab, they tried a new test:

I asked him if I could move an opaque lead screen in and out of the path of the rays while he called out the fluctuations of the screen. He was almost 100 per cent wrong and called out fluctuations when I had made no movement at all, and that proved a lot, but I held my tongue.

He then showed me a dimly lighted clock, and tried to convince me that he could see the hands when he held a large metal file just above his eyes. I asked if I could hold the file, for I had noticed a flat wooden ruler on his desk, and remembered that wood was one of the few substances that never emitted N-rays. ... I felt around for the ruler and held it front of his face. Oh, yes, he could see the hands perfectly.

This also proved something.

The lab's red darkroom lights came back up, and the trio made their way over to the room where Blondlot kept his spectroscope. All the while, Blondlot's skulking assistant—"a sort of high-class laboratory janitor," Wood sniffed—was giving the American dirty looks. The assistant knew something was afoot, but he wasn't sure what. Blondlot, though, was blissfully unaware, and led Wood over to the spectroscope to show off his N-ray-refracting aluminum prisms.

The key to an N-ray spectroscope—any sort of spectroscope, in fact—is its prism. You need it to break the constituent parts of visible light into the bands of red, orange, yellow, and so forth. The aluminum prism in Blondlot's spectroscope did the same thing, except that it split N-rays into distinct wavelengths visible through a view-piece to a graduated luminescent scale. Using this instrument, Blondlot took a series of precise N-ray wavelengths as Wood looked on.

It all sounded impressive, and had seemed like conclusive proof to other visiting scientists. But without looking through the viewer and being able to see the wavelength lines himself, Wood had no empirical way of verifying his colleague's figures.

So he played a very, very dirty trick.

It was with no great relish that Wood later recalled how, with a single wave of hand, he destroyed France's greatest scientist:

I asked him to repeat his measurements, and reached over in the dark and lifted the aluminum prism from the spectroscope. He turned the wheel again, reading off the same numbers as before. I put the prism back before the lights were turned up.

Without a prism in the spectroscope, Blondlot had been staring at nothing. And yet he was still "seeing" the N-rays and reading off their measurements.

With the lights back up, Blondlot decided to call it a night; his eyes were getting tired. But his assistant, still narrowing his eyes at the American, insisted on one more experiment. Wood was ready for him.

As soon as the light was lowered, I moved over towards the prism, with audible footsteps, but I did not touch the prism. The assistant commenced to turn the wheel, and suddenly said hurriedly to Blondlot in French, "I see nothing; there is no spectrum. I think the American has made some derangement." Where upon he immediately turned up the gas and went over and examined the prism carefully.

The assistant glared at Wood, but the American simply stared back placidly. Here was a fine pair before him: a man who didn't see a spectrum when he had a prism, and another who saw a spectrum when he didn't have one.

Wood took the long night train back to Paris, staring out the darkened windows in a deep depression. The next morning he bore an envelope to the postal service. It was addressed to the offices of the journal Nature.

WOOD WAS NOT a cruel man. His letter to Nature, which was rushed into print for the September 29 issue, does not make a single mention of Blondlot's name. It only describes "a visit to one of the laboratories in which the apparently peculiar conditions necessary for the manifestation of this most elusive form of radiation appear to exist." Wood did not even say what country he had been in.

But he didn't need to.

Everybody knew who Wood was talking about. The evidence in his letter was absolutely crushing, and could leave few readers in doubt of his conclusion that "experimenters who have obtained positive results have been in some way deluded." Wood's revelations unleashed a tide of admissions from relieved doctors and physicists that they too had failed to see the rays. They had kept quiet in the past year because, with so many colleagues getting positive results, it was too embarrassing to admit publicly that they just weren't seeing anything.

Almost overnight, papers on N-rays mysteriously vanished from the scientific press. Comptes Rendus, which had been ground zero for the N-ray blast, published just two more papers on the subject—and, Wood mused later, probably only because they were already going to press.

The French scientific establishment didn't back down quite as quickly. Blondlot, after all, was one of its most esteemed and influential members. But when the award ceremonies for the Lecomte Prize were held at the Academies des Sciences that December, sharp-eyed observers noticed something curious about the award citation that accompanied the medal. It was now being inscribed in the name of "his life work, taken as a whole."

There was no mention of N-rays.

AS QUICKLY AS they had appeared on calcium sulfide screens around the world, the ghostly luminescence of N-rays faded away—gone, perhaps, to a better place in the heavens. But there remained one man utterly convinced of their existence here on earth, and that was their discoverer. Blondlot knew what he had seen, and could not be made to back down on any point of evidence. Even as N-rays vanished off the screens of his colleagues, Blondlot pressed ahead with the London publication of an English translation of his papers on the subject, simply titled N-Rays. Along with his papers, Blondlot appended a chapter on how to build and use phosphorescent screens, in effect asking readers to try it out themselves. But when N-Rays came out in the spring of 1905, it evoked little response, except for a pitying notice in Nature:

Prof. Blondlot's experiments are well-contrived, and they give every appearance of being arrangements by which accurate data should be obtained; but in every case the ultimate test is the subjective one made in the mind of the observer as to whether a spot of slightly phosphorescent surface becomes more luminous or not. . . .

Even photographs of sparks and flames being heightened by N-ray exposure, the one seemingly incontrovertible proof that Blondlot had, and which he had made a point of reproducing in plates in his book, looked useless now. Critics noted that it was almost impossible to get a perfectly uniform size in a spark or flame from one moment to the next, so the minute difference shown by the photos proved nothing. They were just the typical variations you'd see in any spark or flame if you photographed it a few times. In any case, a lab worker might unconsciously expose the N-ray photo plate a little longer, so as to get a more impressive effect.

Still, one last hope was offered for legitimacy. In the journal Revue Scientifique, a team of French scientists publicly offered their old colleague a chance to prove N-rays existed. They proposed a test with two identical wooden boxes, which would naturally be neutral and transparent to N-rays. They would place a tempered steel tool in one box, and an inert piece of lead in the other. Blondlot would not know which box was which. He would then take N-ray measurements and determine which box held the ray-emitting chunk of tempered steel.

There was a long silence from Blondlot. And then, in 1906, he sent a letter back to the Revue Scientifique:

Please permit me to decline totally your proposition to cooperate in this simplistic experiment; the phenomena are much too delicate for that. Let each one form his personal opinion about N-rays, either from his own experiments or from those of others in whom he has confidence.

With Blondlot's withdrawal from the tests, N-rays vanished from the realm of science. Physicists could only assume that Blondlot was afraid of the true results, the final humiliating admission that N-rays simply did not exist.

And yet. . . . he could see still them.

BLONDLOT RETIRED JUST three years later, in 1909. That year he ended his career with an unremarkable volume on thermodynamics; there was no mention in it of N-rays, of course. Yet he remained a changed and broken man from his two years of N-ray exposure. As he sank into the long obscurity that preceded his death in 1930, there were whispers among physicists that their old colleague was losing his mind.

Almost all memory of N-rays died with Blondlot. When he was remembered at all, it was among a few physicists who saw him as a cautionary tale of the dangers of self-delusion. Irving Langmuir, who had won the Nobel Prize in Physics—precisely the award that had slipped from Blondot's grasp—was fond of citing Blondlot's downfall as an example of "pathological science." Blondlot had claimed extremely accurate measurements of minute phenomena that many others simply couldn't see, a common pattern for scientific delusions throughout history. Moreover, Langmuir mused in a 1953 speech, N-rays weren't cumulative, and always remained just at the threshold of perception:

You'd think he'd make such experiments as this—to see if with ten bricks he got a stronger effect than he did with one. No, not at all. He didn't get any stronger effect. . . because this is a threshold phenomenon. And a threshold phenomenon means that you don't know, you really don't knoir, whether you are seeing it or not.

Langmuir's remarks weren't published until October 1989, when Physics Today transcribed an old wire recording of the speech. The date of their reprint is not accidental: it was the precise moment at which cold fusion was imploding. Wood never identified Blondlot in his article for Nature, and Physics Today didn't mention Pons and Fleishmann in theirs. Readers knew.

BENEATH THIS TALE of self-delusion, though, there is another and more troubling story. That Blondlot suffered a sort of madness toward the end is obvious: how else could he be seeing spectral wavelength lines after Wood had removed the aluminum prism? But before the heady rush of publicity and fame, before N-rays even had a name, back on that otherwise ordinary day in the winter of 1903 . . . what had made him see that first fatal flicker in his spark detector apparatus? He hadn't even been looking for a new form of radiation, after all—he was simply experimenting with X-rays.

What led such a good scientist astray?

The answer, perhaps, can only be glanced at out of the corner of the eye. The first clue to Blondlot's downfall is contained the last page of his own book on the subject, N-Rays:

It is indispensable in these experiments to avoid all strain on the eye, all effort, whether visual or for eye accommodation, and in no way to try to fix the eye upon the luminous screen whose variations in glow one wishes to ascertain. On the contrary, one must, so to say, see the source without looking at it, and even direct one's glance vaguely in a neighboring direction.

In other words, to see N-rays, you had to look slightly away from the light source. And this was how Blondlot, a careful empiricist working with reliable instruments, had first seen the effect of N-rays on his test apparatus.

There was just one problem: the human eye is not a reliable instrument. It had been long known to astronomers that peripheral vision has some very strange effects on perception. In his 1832 book Letters on Natural Magic, the scientist David Brewster wrote:

It is a curious circumstance, that when we wish to obtain a sight of a very faint star, such as one of the satellites of Saturn, we can see it most distinctly by looking away from it, and when the eye is turned full upon it, it immediately disappears.

This anatomical curiosity was probably not widely known to physicists like Blondlot or Charpentier—after all, that wasn't their field of study.

But lost amid the ebullient shouting out of N-ray discoveries in hundreds of science journal articles in 1904 was a Nature piece on optics and N-rays, a translation of a speech by German physicist Otto Lummer, that excited little commentary among physicists. They would have done well to read their magazines more carefully. In Nature's February 18 issue, long before anyone else, Lummer had deduced that the key to understanding N-rays was the fact that they could only be viewed obliquely:

A whole set of Blondlot's experiments may be almost exactly imitated in their effects without employing any source of illumination whatsoever, and . . . the changes . . . may be referred to the contest between the rods and cones of the retina in seeing in the dark.

In the human eye, rods perceive in black and white, while cones perceive color. The rods have a much lower threshold for stimulation; that's why at nighttime, when light is limited, cones become inactive and the world seems to lose color.

The center of the eye is dominated by cones, while rest of the retina has a combination of rods and cones. This makes good evolutionary sense. You make distinctions of color by staring directly at an object, while minor gradations in light intensity—the shadows and light caused by movements of, say, a sabertooth tiger stalking up behind you at night—are more quickly perceived by the sensitive rods in your peripheral vision. This clever structuring of the eye also results in the odd quirk observed by Brewster and other astronomers so many years before, says Lummer:

Being accustomed to gaze at what sends us light, we turn our eyes in the direction from which the rays come. As, however, the cones have not yet been stimulated ... we cannot see the spot gazed at. Thereby we are confronted by the remarkable fact that we see something which we are not gazing at, whilst it becomes invisible when we wish to fix our eyes upon it.

Likewise, a faintly visible light like a dim spark or phosphorescent screen can appear to become slightly brighter when viewed indirectly. The actual light source hasn't become any stronger; it's just that viewing something from periphery makes it cross a threshold of perception within the eye, by stimulating more rods than it would when stared at directly.

The great tragedy of Rene Blondlot is that on that fateful day in his lab in 1903, he had seen sparks and phosphorescent screens brighten out of the corners of his eyes. But he wasn't seeing a change that reflected an external reality; the excess light only existed in a ghostly electrical impulse along his own optic nerve. And so, in a sense, his critics were right all along.

It really was all in his head.