

Part one

Knowledge

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Newark, New Jersey
United States of America
1917

Katherine Schaub had a jaunty spring in her step as she walked the brief four blocks to work. It was 1 February 1917, but the cold didn't bother her one bit; she had always loved the winter snows of her home town. The frosty weather wasn't the reason for her high spirits on that particular icy morning though: today, she was starting a brand-new job at the watch-dial factory of the Radium Luminous Materials Corporation, based on 3rd Street in Newark, New Jersey.

It was one of her close pals who had told her about the vacancy; Katherine was a lively, sociable girl with many friends. As she herself later recalled, "A friend of mine told me about the 'watch studio' where watch-dial numerals and hands were painted with a luminous substance that made them visible in the dark. The work, she explained, was interesting and of far higher type than the usual factory job."¹ It sounded so glamorous, even in that brief description—after all, it wasn't even a factory, but a "studio". For Katherine, a girl who had "a very imaginative temperament,"² it sounded like a place where anything could happen. It certainly beat the job she'd had before, wrapping parcels in Bamberger's department store; Katherine had ambitions far beyond that shop floor.

She was an attractive girl of just fourteen; her fifteenth birthday was in five weeks' time. Standing just under five foot four, she was "a very pretty little blonde"³ with twinkling blue eyes, fashionably bobbed hair and delicate features. Although she had received only a grammar-school education before she left school—which was "about all the education that girls of her working-class background received in those days"⁴—she was nevertheless fiercely intelligent. "All her life," *Popular Science* later wrote, "Katherine Schaub had cherished [the] desire to pursue a literary career."⁵ She was certainly go-getting: she later wrote that, after her friend had given her word of the opportunities at the watch studio, "I went to the man in

charge—a Mr. Savoy—and asked for a job.”⁶

And that was how she found herself outside the factory on 3rd Street, knocking on the door and gaining admittance to the place where so many young women wanted to work. She felt almost a little star-struck as she was ushered through the studio to meet the forewoman, Anna Rooney, and saw the dial-painters turning diligently to their tasks. The girls sat in rows, dressed in their ordinary clothes and painting dials at top speed, their hands almost a blur to Katherine’s uninitiated eyes. Each had a flat wooden tray of dials beside her—the paper dials were pre-printed on a black background, leaving the numerals white, ready for painting—but it wasn’t the dials that caught Katherine’s eye, it was the material they were using. It was the radium.

Radium. It was a wonder element; everyone knew that. Katherine had read all about it in magazines and newspapers, which were forever extolling its virtues and advertising new radium products for sale—but they were all far too expensive for a girl of Katherine’s humble origins. She had never seen it up close before. It was the most valuable substance on earth, selling for \$120,000 for a single gram (\$2.2 million in today’s values). To her delight, it was even more beautiful than she had imagined.

Each dial-painter had her own supply. She mixed her own paint, dabbing a little radium powder into a small white crucible and adding a dash of water and a gum-arabic adhesive: a combination that created a greenish-white luminous paint, which went under the name “Undark”. The fine yellow powder contained only a minuscule amount of radium; it was mixed with zinc sulphide, with which the radium reacted to give a brilliant glow. The effect was breathtaking.

Katherine could see that the powder got everywhere; there was dust all over the studio. Even as she watched, little puffs of it seemed to hover in the air before settling on the shoulders or hair of a dial-painter at work. To her astonishment, it made the girls themselves gleam.

Katherine, like many before her, was entranced by it. It wasn’t just the glow—it was radium’s all-powerful reputation. Almost from the start, the new element had been championed as “the greatest find of history.”⁷ When scientists had discovered, at the turn of the century, that radium could destroy human tissue, it was quickly put to use to battle cancerous tumors, with remarkable results. Consequently—as a life-saving and thus, it was assumed, health-giving element—other uses had sprung up around it. All of Katherine’s life radium had been a magnificent cure-all, treating not just cancer, but hay fever, gout, constipation...anything you

could think of. Pharmacists sold radioactive dressings and pills; there were also radium clinics and spas for those who could afford them. People hailed its coming as predicted in the Bible: “The sun of righteousness [shall] arise with healing in his wings, and ye shall go forth and gambol as calves of the stall.”⁸

For another claim of radium was that it could restore vitality to the elderly, making “old men young.”⁹ One aficionado wrote: “Sometimes I am halfway persuaded that I can feel the sparkles inside my anatomy.”¹⁰ Radium shone “like a good deed in a naughty world.”¹¹

Its appeal was quickly exploited by entrepreneurs. Katherine had seen adverts for one of the most successful products, a radium-lined jar to which water could be added to make it radioactive: wealthy customers drank it as a tonic; the recommended dose was five to seven glasses a day. But as some of the models retailed for \$200 (\$3,700), it was a product far out of Katherine’s reach. Radium water was drunk by the rich and famous, not working-class girls from Newark.

What she did feel part of, though, was radium’s all-pervasive entry into American life. It was a craze, no other word for it. The element was dubbed “liquid sunshine”¹² and it lit up not just the hospitals and drawing rooms of America, but its theatres, music halls, grocery stores and bookshelves. It was breathlessly featured in cartoons and novels, and Katherine—who loved to sing and play piano—was probably familiar with the song “Radium Dance”, which had become a huge hit after featuring in the Broadway musical *Piff! Paff! Puff!* On sale were radium jockstraps and lingerie, radium butter, radium milk, radium toothpaste (guaranteeing a brighter smile with every brushing) and even a range of Radior cosmetics, which offered radium-laced face creams, soap, rouge, and compact powders. Other products were more prosaic: “The Radium Eclipse Sprayer,” championed one advert, “quickly kills all flies, mosquitoes, roaches. [It] has no equal as a cleaner of furniture, porcelain, tile. It is harmless to humans and easy to use.”¹³

Not all of these products actually contained radium—it was far too costly and rare for that—but manufacturers from all kinds of industries declared it part of their range, for everyone wanted a slice of the radium pie.

And now, to Katherine’s excitement, thanks to her job she would have a prime seat at the table. Her eyes drank in the dazzling scene before her. But then, to her disappointment, Miss Rooney ushered her into a room that was separate to the main studio, away from the

radium and the shining girls. Katherine would not be dial-painting that day—nor the day after, as much as she longed to join the glamorous artists in the other room.

Instead, she would be serving an apprenticeship as an inspector, checking the work of those luminous girls who were busy painting dials.

It was an important job, Miss Rooney explained. For although the company specialised in watch faces, they also had a lucrative government contract to supply luminous airplane instruments. Given there was a war raging in Europe, business was booming; the company also used its paint to make gunsights, ships' compasses and more shine brightly in the dark. And when lives were hanging in the balance, the dials had to be perfect. "[I was] to see that the number outlines were even and [thorough] and to correct minor defects,"¹⁴ Katherine recalled.

Miss Rooney introduced her to her trainer, Mae Cubberley, and then left the girls to it, resuming her slow march up and down the rows of painting girls, casting a watchful eye over their shoulders.

Mae smiled at Katherine as she said hello. A twenty-six-year-old dial-painter, Mae had been with the company since the previous fall. Although she was new to the industry when she joined, she already had a reputation as a brilliant painter, regularly turning in eight to ten trays of dials daily (there were either twenty-four or forty-eight dials in each tray, depending on the dial size). She had quickly been promoted to training other girls in the hope that they would match her productivity. Now, in the little side room, she picked up a paintbrush to instruct Katherine in the technique that all the dial-painters and inspectors were taught.

They were using slim camel-hair brushes with narrow wooden handles. One dial-painter recalled: "I had never seen a brush as fine as that. I would say it possibly had about thirty hairs in it; it was exceptionally fine."¹⁵ Yet as fine as the brushes were, the bristles had a tendency to spread, hampering the girls' work. The smallest pocket watch they painted measured only three-and-a-half centimeters across its face, meaning the tiniest element for painting was a single millimeter in width. The girls could not go over the edges of these delicate parameters or there would be hell to pay. They had to make the brushes even finer—and there was only one way they knew of to do that.

"We put the brushes in our mouths,"¹⁶ Katherine said, quite simply. It was a technique called lip-pointing, inherited from the first girls who had worked in the industry, who came from china-painting factories.

Unbeknown to the girls, it wasn't the way things were done in Europe, where dial-painting had been in operation for over a decade. Different countries had different techniques, but in none was lip-pointing used. Very likely this was because brushes weren't used either: in Switzerland there were solid glass rods; in France, small sticks with cotton wadding on the ends; other European studios employed a sharpened wooden stylus or metal needles.

However, American girls did not take up the lip-pointing technique with blind faith. Mae said that when she first started, not long after the studio had opened in 1916, she and her colleagues had questioned it, being "a little bit leery"¹⁷ about swallowing the radium. "The first thing we asked," she remembered, "[was] 'Does this stuff hurt you?' And they said, 'No.' Mr. Savoy said that it wasn't dangerous, that we didn't need to be afraid."¹⁸ After all, radium was the wonder drug; the girls, if anything, should benefit from their exposure. They soon grew so used to the brushes in their mouths that they stopped even thinking about it.

But for Katherine it felt peculiar, that first day, as she lippointed over and over, correcting defective dials. Yet it was worth persevering: she was constantly reminded why she wanted to work there. Her job involved two types of inspection, daylight and darkroom, and it was in the darkroom that the magic really happened. She would call the girls in to discuss their work and observed, "Here in the room—daylight barred—one could see evidences of the luminous paint everywhere on the worker. There was a dab here and there on her clothes, on the face and lips, on her hands. As some of them stood there, they fairly shone in the dark."¹⁹ They looked glorious, like otherworldly angels.

As time went on, she got to know her colleagues better. One was Josephine Smith, a sixteen-year-old girl with a round face, brown bobbed hair and a snub nose. She had used to work at Bamberger's too, as a saleslady, but left to earn the much higher wage of a dial-painter. Although the girls weren't salaried—they were paid piecework, for the number of dials they painted, at an average rate of 1.5 cents a watch—the most talented workers could walk away with an astonishing pay packet. Some earned more than three times the average factory-floor worker; some even earned more than their fathers. They were ranked in the top 5 percent of female wage-earners and on average took home \$20 (\$370) a week, though the fastest painters could easily earn more, sometimes as much as double; giving the top earners an annual salary of \$2,080 (almost \$40,000). The girls lucky enough to gain a position felt blessed.

Josephine, Katherine learned as they talked, was of German heritage, just like Katherine

herself. In fact, most dial-painters were the daughters or granddaughters of immigrants. Newark was full of migrants, hailing from Germany, Italy, Ireland and elsewhere; it was one of the reasons the company had opened the studio in the city in the first place, for the large immigrant communities provided a workforce for all sorts of factories. New Jersey was nicknamed the Garden State for its high agricultural production, but in truth it was just as productive industrially. At the turn of the century, the business leadership of Newark had labeled it the City of Opportunity and—as the girls themselves were finding out—it lived up to its name.

It all made for a thriving metropolis. The nightlife after the factories closed was vibrant; Newark was a beer town, with more saloons per capita than any other American city, and the workers made their downtime count. The dial-painters embraced the social bonhomie: they sat together to eat lunch in the workroom at the Newark plant, sharing sandwiches and gossip over the dusty tables.

As the weeks passed, Katherine observed the challenges as well as the attractions of dial-painting: Miss Rooney's constant observation as she walked up and down the studio, and the ever-present dread of being called into the darkroom to be reprimanded for poor work. Above all else, the girls feared being accused of wasting the expensive paint, which could ultimately be a dismissible offense. But although Katherine could see that there were downsides, she still longed to join the women in the main room. She wanted to be one of the shining girls.

A quick learner, Katherine soon excelled at her inspecting, not only perfecting the art of correcting defective dials with her lip-pointed brush, but also becoming adept at brushing off the dust with her bare hand or removing excess paint with her fingernail, as was the technique taught her. She worked as hard as she could, longing for promotion.

Finally, toward the end of March, her perseverance paid off. "I was asked to paint dials," she wrote excitedly; "I said I would like to try it."²⁰

Katherine had achieved her ambition through merit—but there were also wider forces at work in that spring of 1917. Dial-painters were about to be in demand like never before: the company now needed all the women it could get.

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- 1 “A friend of” Katherine Schaub (KS), autobiography (*Survey Graphic*, 1932), p.1.
 - 2 “a very imaginative” Dr. E. B. Krumbhaar, letter to Raymond H. Berry, 21 June 1929, RBP, reel 3.
 - 3 “a very pretty” *New York Sun*.
 - 4 “about all the” William D. Sharpe, MD, “Radium Osteitis with Osteogenic Sarcoma: The Chronology and Natural History of a Fatal Case’.
 - 5 “All her life” *Popular Science*, July 1929.
 - 6 “I went to” KS, memo to Berry, RBP, reel 1.
 - 7 “the greatest find” *Chicago Daily Tribune*, 21 June 1903.
 - 8 “The sun of” The Bible, Malachi 4:2, cited by Dr. Howard Kelly in the *Newark Evening News*, 9 Jan 1914.
 - 9 “old men young” Mr. Smith, court transcript, 26 April 1928.
 - 10 “Sometimes, I am” JFJ, advertising brochure for the Radiumator, Harrison Martland Papers (HMP), Rutgers Biomedical and Health Sciences.
 - 11 “like a good” *American* magazine, Jan 1921.
 - 12 “liquid sunshine” Cited in John Conroy, “Radium City’.
 - 13 “The Radium Eclipse” Advertisement, LaSalle County Historical Society & Museum.
 - 14 “[I was] to see” KS, memo to Berry, RBP, reel 1.
 - 15 “I had never” Alice Tolan, court transcript, 26 Nov 1934.
 - 16 “We put the” KS, memo to Berry, RBP, reel 1.
 - 17 “a little bit” Mae Cubberley Canfield, examination before trial, RBP, reel 2.
 - 18 “The first thing” Ibid.
 - 19 “Here in the” KS, autobiography, p.1.
 - 20 “I was asked” KS, memo to Berry, RBP, reel 1.