

Agfacolor at 90: The Race for Color and the Technology That Endured

In October 1936, “AGFACOLOR Neu” was introduced as the world’s first modern single-strip color film, triggering a “photographic” arms race during WWII. It endured long after and provided the foundation for many other international color film formats after the war; its specific color tones and palette gave many Eastern European films an iconic look. On this 90th anniversary, we should remember this important part of film history.

By Michael Zink

When Wilhelm Schneider took a “small detour into color photography,”¹ he did not know he was on the precipice of a world invention that would leave its mark on photography and cinematography to this day. Dr. Schneider worked at the Agfa Filmfabrik (film factory) in Wolfen, Germany, where he focused primarily on developing black-and-white film. However, in 1932, he noticed that colored residual images sometimes appeared during the development process. This discovery ultimately led to the invention of the first subtractive 3-color, chromogenic monopack reversal film, Agfacolor Neu, which celebrates the 90th anniversary of its debut on October 17, 1936.

The Original Work from Rudolf Fischer

The foundation of Schneider’s work was based on research from about twenty years prior, when Dr. Rudolf Fischer discovered that “the addition of ‘certain materials’ to certain developing solutions [...] created a dye image.”² He patented multiple inventions related to this discovery in 1911/12, describing how a single film could contain three light-sensitive layers, each containing a so-called “color coupler” that reacted with the developer to generate the desired colors. The goal was simple and appealing: an integrated monopack film in which three layers of color couplers were part of the emulsion to provide the chromogenic attributes. In other words, the colors would be generated in the film emulsion itself. If those layers were thin enough, the film could be run through existing cameras, allowing any user familiar with black-and-white photography to record color photographs.

However, Fischer’s invention faced several challenges. Coupler instability could cause color shifts, and coupler migration could result in muddy-looking images. Additionally,

reducing the film thickness to leverage existing equipment was not trivial either. In fact, Fischer solved none of these challenges, and his ideas did not materialize until Schneider picked up the work some 20 years later.

The Agfacolor Invention

Schneider and his team at Agfa found that “it was possible to anchor couplers within the proper emulsion layer by attaching long, fatty acids as side groups on the dye-coupler ring structures.”² This discovery prevented the migration of the couplers into other emulsion layers, solving some of the biggest issues with Fischer’s invention.³ Schneider’s invention was patented in 1935, describing improvements for dye diffusion, and it was the basis of the “Agfacolor Neu” film.

Furthermore, the researchers were able to “manufacture a three-layer product that was no thicker than black-and-white stocks, greatly reducing light scatter and greatly improving sharpness.”² Another major advantage of these new color couplers was that a single developer could be used for all three color layers at the same time to generate the desired dyes. This proved to be a significant improvement from a process perspective.

The Kodachrome Approach

Earlier that year (1935), Kodak introduced its own integral 3-color system—Kodachrome—into the market, beating Agfa. However, that system did not solve the coupler-migration issue; instead, it used a workaround. The couplers were part of the developer solution, not the film itself. While this had some compelling benefits, such as a thin film with less light scattering, resulting in crisper images with vibrant color, the problem was the complexity of the film development process.

The Kodak process required multiple different machines

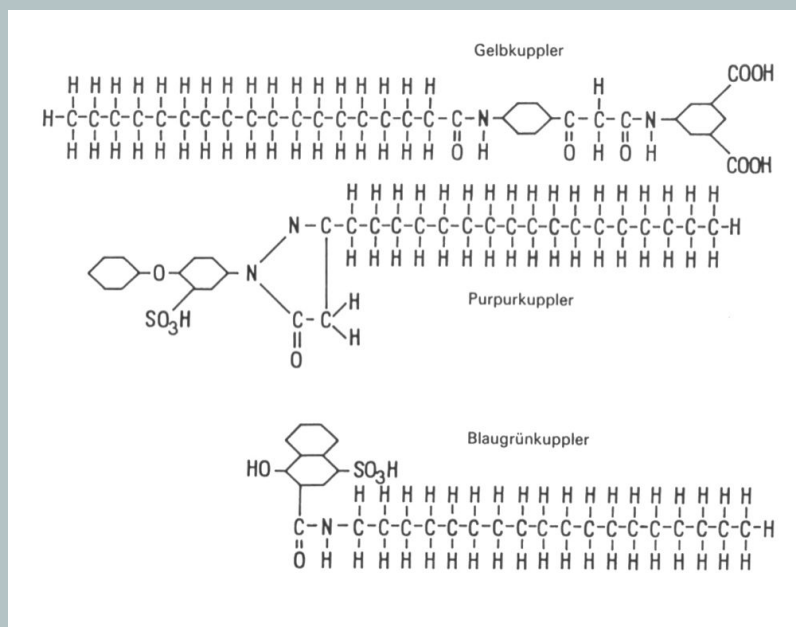


Figure from "film production," brochure of VEB Filmfabrik Wolfen (ORWO), GDR 1981.



Das kalte Herz (GDR 1950, Paul Verhoeven). Credit: DEFA Foundation. Photographs of the Orwo-color print by Josephine Diecke, SNSF project Film Colors. Technologies, Cultures, Institutions.

and chemical baths, and even after process improvements over the next few years, "Kodachrome processing consisted of at least 28 discrete steps," keeping it "enormously complex."²

By contrast, Agfacolor Neu had the color couplers in the film emulsion itself, which meant the film could be developed in only four baths. Coincidentally, that was the same number of baths required for black-and-white film, and obviously a huge reduction compared to the 28 steps with Kodachrome.

The "Arms Race" Between Rochester & Wolfen

Given that the breakthrough pursued by Schneider's team was interrupted by the launch of Kodachrome in April 1935, followed by the release of Agfacolor Neu in October 1936, the race between both sites—Kodak in Rochester, NY, and Agfa in Wolfen—intensified. The team at Wolfen grew to about 50 people, which was remarkable, because Schneider's department (the Technical-Scientific Laboratory) was not originally responsible for color film research. Instead, they

were responsible for finding practical applications for work from another department (the Scientific Photo Laboratory). But given their success, Schneider received approval from his manager, Gustav Wilmanns, to formally pursue this research.³

The team size at Kodak likely grew to similar dimensions, and the battle expanded to other fronts as well. On the legal front, Kodak objected to the original patent underpinning the Agfacolor Neu process, but the lawsuit was ultimately settled in 1943. Then there was the geopolitical conflict between the two countries: World War II.

Immediately after the announcement of "Agfacolor Neu," German propaganda minister Joseph Goebbels pressured the team at Agfa to move forward with color film production. He understood the value of color images as psychologically, geopolitically, and strategically important.

In fact, in 1939, the decision was made to switch the German cinema production to the new Agfacolor process, as the production of the first full-feature film "Frauen sind doch bessere Diplomaten" ("Women Are Better Diplomats") got

underway. The production was anything but flawless, and Schneider, who was present for much of the filming, realized the film required four times as much lighting as black-and-white films. After many improvements to the film material and multiple reshoots, the film was released in October 1941, but the color reproduction was not fully satisfactory.¹

Subsequent UFA productions achieved much better color reproduction, including “Die Goldene Stadt” (“Golden City”), which premiered in October 1942, followed by the large-scale production of “Münchhausen” (“The Adventures of Baron Munchhausen”), which premiered in March 1943.¹

Post-War Situation

After World War II, the Agfacolor process and methods attracted worldwide interest. Kodak and many other companies sent specialists “for a debriefing of Agfa color chemists.” Ultimately, “the US government seized the Agfa Corporation’s chemical patents, and published them ‘without restrictions or license’ in 1945.”²

As a result, many international photographic companies adopted or improved on the Agfacolor framework. This included notable names such as Fujicolor (Japan), Sovcolor (Soviet Union), Gevacolor (Belgium), and Ansco Color (U.S.), among others.

When Kodak ultimately released Eastmancolor in 1950, it paved the way for a single-strip color film to be used with much more simplicity in Hollywood productions, replacing the much more complicated Technicolor process.

To this day, it is not entirely clear whether the Kodak solution was a derivative of the Agfa solution, but most evidence suggests the similarities are merely correlation and that both systems were developed in parallel. Both Agfa and Kodak were under enormous government pressure during wartime, but “the war also ensured that the American and German corporations worked largely in isolation from each other.”²

After the post-war division of Germany, the Agfa Filmfabrik in Wolfen was on Soviet territory. Agfa also opened a new plant in West Germany (in Leverkusen on British territory). For several years, both plants produced films under the same “Agfacolor” name, yet the processes were different derivatives. In 1964, the Filmfabrik in Wolfen changed its name to

ORWO (which stands for ORiginal WOlfen) and rebranded future films as “Orwocolor.”³⁴

The Agfacolor Legacy

Agfacolor remained the foundational color system across the Soviet Union (under the brand name “Sovcolor”) and the Eastern Bloc. East Germany’s film production studio DEFA released its first film in Agfacolor in 1950: “Das kalte Herz” (“Heart of Stone”). It remains one of DEFA’s most successful films, with almost 10 million tickets sold at release.

Between 1950 and 1964, DEFA produced more than 50 feature films in Agfacolor. After that, the brand disappeared when it was renamed Orwocolor.

In 1969 at the 41st Academy Awards, the film “War and Peace” won the Oscar® for Best Foreign Language Film. The 70mm epic film was primarily shot in Sovcolor, but problems with unstable Soviet film batches required filmmakers to turn to Wolfen, drawing on its expertise and using Orwo film stock to supplement production.

Orwocolor remained a major success in East Germany and across the Eastern Bloc until the Filmfabrik was liquidated in 1994, following German reunification. Even after its dissolution, however, the inventions developed by Schneider and his colleagues at Agfa endured and remain a critical part of film technology to this day.

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Thank you to Michael Zink for contributing this historical overview, an important chapter in motion imaging history.

DOI: 10.5594/JMI.2026/SOV09428

Date of publication: 1 October 2026