

ORWO Film: The Original Wolfen Story

Moving Image and Sound: Basic Issues and Training

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ORWO, or “Original Wolfen”, is an East German film stock produced from 1964 to roughly 1990, until it and a limited selection of its original products were bought and put back on the market by FilmoTec GmbH in 1998.¹ Although ORWO originally sold many products, including magnetic tape, photographic film, and several types of film stock, my research will focus on ORWO color, which was used primarily for feature film in East Germany during the Cold War.² It should be noted that scholars differ in their spelling of ORWO color (e.g. Orwocolor, ORWOCOLOR, and Orwo color), but for my research I will be consistent in its spelling as “ORWO color”. ORWO color had a particular economic and political significance to East Germany, or the GDR, during the political isolation of Eastern Europe during the Cold War. ORWO film was used as a tool for propaganda, not only by the content it carried, but in the product itself.

After the end of World War II, East and West Germany were split into two separate states, the German Democratic Republic (GDR) and the Federal Republic of Germany (FRG), respectively. However, before the end of the war, the film company Agfa was producing very popular color film stock in Germany that the nations further west soon wanted to get their hands on.³ Before the war, the Nazi Party had been anxious to create their own color film system in response to the success of Technicolor in the United States.⁴ The Agfa film company started to produce color film using their own technology. By 1939, Germany had succeeded in creating its first color negative-positive film with a proprietary color system, using dye couplers in the

¹ORWONA. ORWO North America, 2015. Web. 11 Oct. 2015.

² Ibid.

³Andrew, Dudley. “The Postwar Struggle for Color”. *Cinema Journal* 18.2 (1979): 47.

⁴Enticknap, Leo. *Moving Image Technology from Zoetrope to Digital*. London: Wallflower Press. 2005. 91.

emulsion.⁵ This was a revolutionary color film process which made color film processing much faster and with fewer steps.⁶

During World War II, the exclusive Agfacolor system was unavailable to the United States and other Allied countries. The film was in such high demand that “Americans sent federal investigators to interrogate Agfa scientists being held by the Allies as prisoners of war”.⁷ However, the end of the war finally opened the technology to both the Americans and the Soviets. More important to my research and to the technology used to create ORWO color film, an Agfa plant in Prague was looted for its equipment and chemicals by the Soviet Russians shortly after the war.⁸ Because the Soviets had access to the Agfacolor technology, it would be a simple step to set up East Germany, a region occupied by the Soviet Union during the Cold War, with a color film manufacturing company, such as ORWO.

The start of the ORWO film company is even more closely tied to Agfa than the theft of Agfa’s film technology at the close of the Second World War. ORWO was created as an offshoot of the Agfa film company and was even based in an old Agfa plant in Wolfen, Germany.⁹ ORWO made a conscious choice to reference its ties to the famous Agfa film company by deriving its name from the words “Original Wolfen”.¹⁰ However, the company did not take this name until 1964, before which it operated under the name VEB Filmfabrik AGFA.¹¹ During the Cold War, two Agfa-based companies existed in Germany, one in East Germany and one in the West. The only way to distinguish the two companies was by their plant locations; the East

⁵ Ibid, 92.

⁶ Ibid.

⁷ Ibid.

⁸ Ibid.

⁹ ORWONA. ORWO North America, 2015. Web. 11 Oct. 2015.

¹⁰ Ibid.

¹¹ Enticknap, Leo. *Moving Image Technology from Zoetrope to Digital*. London: Wallflower Press. 2005. 25.

German company was referred to as Agfa Wolfen, while the West German company was called Agfa Leverkusen.¹² Because of the possible confusion in terms of trademark and the competition between the two companies, a peaceful agreement between the two companies was settled in 1964, which resulted in the renaming of Agfa Wolfen to ORWO, while Agfa Leverkusen got to retain its name.¹³ When looking at the economic relation between the East and West, it is easy to see why the West was able to keep its name, forcing the Wolfen plant to rebrand. East Germany relied more heavily on imports from the West and could not afford to upset such an important supplier.¹⁴ However, following this period, mutual trade declined as well as many other economic links between East and West Germany.¹⁵ Whether this was due to economic forces or changes in political climate (such as the building of the Berlin Wall in 1961), this change in trade relations had direct implications on the production of ORWO film and the types of works created on it.

Political figures in the GDR had great interest in using film, both feature and documentary, as a social tool. Similar to Nazi propaganda minister Joseph Goebbels, Nikita Khrushchev realized the potential film had for disseminating political and ideological messages.¹⁶ Unlike Western culture, leaders in East Germany were more interested in the political value of film, not the commercial.¹⁷ Because of this attitude, the content of any film created in the GDR would be of great interest and importance to political leaders. All films

¹²Roesler, Jorg. *Economic Change and the National Question in Twentieth-Century Europe*. New York: Cambridge University Press, 2000. 55.

¹³Enticknap, Leo. *Moving Image Technology from Zoetrope to Digital*. London: Wallflower Press. 2005. 25.

¹⁴Roesler, Jorg. *Economic Change and the National Question in Twentieth-Century Europe*. New York: Cambridge University Press, 2000. 55.

¹⁵ Ibid, 56.

¹⁶Brockmann, Stephen. *A Critical History of German Film*. Rochester, N.Y.: Camden House, 2010. 216.

¹⁷ Ibid.

produced in East Germany were subject to the scrutiny of the state. To help control film content, the state-controlled film company, DEFA (Deutsche Filmaktiengesellschaft), was created in 1946.¹⁸

Because of the nature of Soviet politics, East Germany did not have any privately-owned film production companies.¹⁹ Films were produced through DEFA by the state and ORWO was the only film manufacturer present in East Germany at the time.²⁰ Both DEFA films and ORWO film stock were limited in their distribution. Stephen Brockmann explains that films produced in East Germany “remained relatively unknown in West Germany and the rest of the western world” until German unification in 1990.²¹ Brockmann argues that this is due to the complex film distribution system in the west.²² However, the political climate surrounding Cold War Europe was most likely another significant factor. When it was able, DEFA worked with and exported its films almost exclusively to Communist Eastern European countries.²³ Although West and East Germany shared a common border, West Germany was unwilling to strike any deals with its communist neighbor.²⁴

Similarly, although ORWO enjoyed a monopoly on film stock production in East Germany, its products struggled to reach the western world. With the split of the Agfa film company following the Second World War, Agfa Wolfen rebranded and agreed to sell to Eastern

¹⁸Allan, Sean. *DEFA: East German Cinema, 1946 – 1992*. New York: Berghahn Books, Incorporated, 1999. 1.

¹⁹Loprich, Frank and Katrin Schlosser. “Cinema after the GDR’s Downfall: The Story of O-Film.” *DEFA After East Germany*. Ed. Brigitta B. Wagner. Rochester: Boydell & Brewer Inc, 2014. 123.

²⁰ Ibid, 124.

²¹Brockmann, Stephen. *A Critical History of German Film*. Rochester, N.Y.: Camden House, 2010. 213.

²² Ibid.

²³Heiduschke, Sebastian. *East German Cinema: DEFA and Film History*. Gordonsville, VA, USA: Palgrave Macmillan, 2013. 19.

²⁴ Ibid.

Europe while Agfa Leverkusen retained its name and selling rights to the rest of the world.²⁵ORWO's isolation to East Germany and Eastern Europe echoes that of DEFA. The Iron Curtain cutting off DEFA produced films and ORWO film stock from the rest of the world along with the East German state's desire to control all aspects of film production created a symbiotic relationship between DEFA and ORWO. Many DEFA color film were shot on ORWO color film stock, which was a bestselling stock across Eastern Europe.²⁶ ORWO's black and white film stock also sold well, making ORWO a main supplier to the Soviet Union and Eastern Bloc countries.²⁷Because ORWO was an important film stock for the Soviet Union, but was manufactured exclusively in East Germany, it raised the reputation of East Germany's contribution to culture and film. As DEFA and ORWO were the only of their kind in East Germany, their work was inextricably tied. Often, the content of DEFA films was literally imprinted upon ORWO film stock. Therefore, the success of one company could help the other.

Because of DEFA and ORWO's relationship with the state, neither entity encountered any real competition within East Germany. ORWO was East Germany's only film stock producer, of both black and white and color. However, ORWO was not the only manufacturer of film stock that sold to Eastern Europe. For example, another producer of color film stock, named Sovcolor, was created by the Russians using the technology and processes found in an abandoned Agfa plant at the close of World War II.²⁸Like ORWO color, Sovcolor was founded on the proprietary technology used to create Agfacolor films; both have a three-layer emulsion

²⁵ORWONA. ORWO North America, 2015. Web. 11 Oct. 2015.

²⁶Berghahn, Daniela. "East German Cinema After Unification." *German Cinema: Since Unification*. Ed. David Clarke. London: Continuum, 2006. 97.

²⁷Enticknap, Leo. *Moving Image Technology from Zoetrope to Digital*. London: Wallflower Press. 2005. 25.

²⁸Ibid, 92.

using dye couplers.²⁹ Although there are several notable films printed on Sovcolor, such as Sergei Bondarchuk's *War and Peace* (1968), ORWO color still remained a bestselling film stock in Eastern Europe during the Cold War.³⁰

The chemical composition of ORWO color film (particularly NC3) along with the proprietary formula for its processing are extremely difficult to find. Perhaps this is because it is no longer manufactured, was only manufactured in Germany, or was manufactured in such tense political times. However, on the listserv of the Association of Moving Image Archivists (AMIA), Jose Llufrío contributed to a discussion by explaining that “principally the chemistry for Agfa and then renamed Orwo was very similar”.³¹ Both films are moving image color films using silver dye coupling technology.³² The dyes are coupled with silver halides within the emulsion, making the color process subtractive, rather than additive. Each emulsion layer is sensitive to one of the primary colors; the top layer is sensitive to blue light, the middle to green, and the bottom (just above the base) is sensitive to red.³³ To keep each color separated, each emulsion layer is divided by yellow filter layers which vanish when the film is developed.³⁴ The colors produced during development are those that are complementary to their particular light-sensitive emulsion layer; the blue-sensitive layer becomes yellow, the green-sensitive layer becomes magenta, and the layer sensitive to red becomes cyan.³⁵ Agfacolor was a desirable color film because it could

²⁹Coe, Brian. *The History of Movie Photography*. Westfield, NJ: Eastview Editions, 1981. 138.

³⁰Misek, Richard. *Chromatic Cinema: A History of Screen Color*. West Sussex: John Wiley & Sons Ltd, 2010. 80.

³¹Llufrío, Jose. Interview with Martin Koerber. *Association of Moving Image Archivists*. AMIA, 2013. Web. 2 Nov 2015.

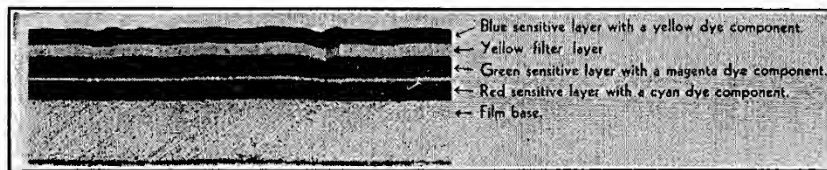
³²Forrest, J. L. and F. M. Wing. “The New Agfacolor Process.” *Journal of the Society of Motion Picture Engineers* 29.3 (1937): 248 – 257. 254.

³³ Ibid.

³⁴ Ibid.

³⁵ Ibid, 255.

be processed quickly and could be “exposed in an ordinary camera”³⁶ All of the advances Agfacolor made in motion picture color film technology would be put to use in the production of ORWO color film stock.



<http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7254073>

There are several amateur blogs about both ORWO and Agfacolor film. One, photomorbelia.co.uk, outlines the processing steps for Agfacolor motion picture negative film.³⁷ It is important to note the unusual 15-minute wash time, most likely due to the fact that it is subtractive film; the dye layers are incorporated into the emulsion during its manufacture.³⁸ This separates it from other color films popular at the time, such as additive color film Kodachrome manufactured by Eastman Kodak in the United States.³⁹ Offering more insight into ORWO’s particular developing process is an article from the mid-1980s concerned with film bleach’s effect on the environment. It explains that DEFA mostly used ferricyanide bleach but was considering switching to persulfate/quinone bleach and had run some successful tests on ORWO film stock, particularly ORWO color NC3.⁴⁰

³⁶ Ibid, 256.

³⁷ Fisher, Maurice. “Early Agfa colour materials – researched by Michael Talbert.” *Photographic Memorabilia*. n.p., 15 May 2015.

³⁸ Gernsheim, Helmut. *A Concise History of Photography*. Toronto: General publishing Company, Ltd., 1986. 28.

³⁹ Ibid.

⁴⁰ Keiler, J. A., and G. Pollakowski. "Persulfate/Quinone Bleach - Environmental and Economic Aspects." *Society of Motion Picture & Television Engineers* 95.2 (1986): 220.

First three steps in total darkness, or under a Green safelight (possibly Agfa Safelight filter No.170, very dark green.)	
1. Colour Developer	6 minutes
The film was then wiped with rubber squeegees, before going into the following wash. The film was spray washed after the development step, but a fast circulating wash was also effective. It is possible that a certain amount of "after development" took place in this first wash from traces of active developer remaining in the film.	
2. Wash.	15 Minutes
3. Bleach.	3 - 5 minutes
The rest of the processing could take place in "White light".	
4. Wash. This was spray washing or fast circulating water.	5 minutes.
5. Fixer	5 minutes.
6. Spray wash	20 minutes.
7. Dry	It is possible that the films were rinsed in a Wetting Agent, maybe "Agfa Agepon", before drying.

http://www.photomemorabilia.co.uk/Colour_Darkroom/Early_Agfa.html#anchorAgfa4

Only a written description of ORWO film's edge code was available, rather than any other reliable pictorial or physical examples. Jose Llufrío, who worked with ORWO film for several years in Cuba, explains on the AMIA listserv that the "letters O, R, W, and O are printed between the perforations" and next is a pair of characters which indicates the manufacturing date.⁴¹ The manufacturing date is discerned first by a letter to represent each month (A for January, B for February, etc.), while skipping the letter I to avoid confusion with the number 1).⁴² The next character is a single number to indicate the year (4 for 1964, 1974, or 1984).⁴³ Below is a prototype of an ORWO edge code I created using an image of plain 35mm film.⁴⁴ In this case, this would be ORWO film manufactured in September of 1967, 1977, or 1987. This edge code system requires film inspection to determine the correct decade. From my own inspection of ORWO color NC3 film, I believe the perforations follow the Kodak Standard (KS). By comparing the film to Holographic Kodak film, which would most likely have KS

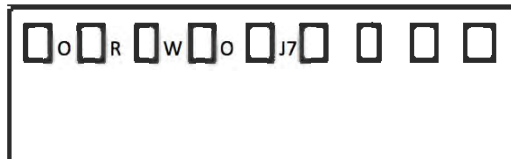
⁴¹Llufrío, Jose. Interview with Steve Greene. *Association of Moving Image Archivists*. AMIA, 2005. Web. 2 Nov 2015.

⁴² Ibid.

⁴³ Ibid.

⁴⁴"How Various 3D Formats appear on-film." Rocky Mountain Memories. n.p., n.d. 5 Nov 2015.

perforations, the two sets of film perforations lay over each other exactly⁴⁵. Both types of film also have perforations on both sides of the film. It is an interesting choice for ORWO color film negatives considering most negatives during the era used Bell and Howell perforations for negatives and Kodak Standard perforations for positives.⁴⁶



<http://www.rmm3d.com/3d.encyclopedia/formats/on.film.html>

As previously mentioned, all aspects of film production were controlled by the state, through the film production company DEFA. Because equipment was also supplied by the state (DEFA), there were direct implications on ORWO film production. For example, one East German filmmaker, Andrew Thorndike, wanted to create a work using 70mm film, technology that had not yet reached East Germany.⁴⁷ Because of the director's reputation and the importance of film to the East German State, the project was approved, but required the development of new technology and equipment borrowed from Russia.⁴⁸ The result was a new East German 70mm cinematic camera, the DEFA Reflex, and the manufacturing of 70mm ORWO color film.⁴⁹ Again, we see the symbiotic relationship between ORWO and DEFA, as ORWO was the only film supplier present in East Germany and DEFA was the only film production company. As the production company, DEFA would have creative control of this project (within the

⁴⁵ "Film Specifications." *Kodak*. Kodak, n.d.

⁴⁶ Ibid.

⁴⁷ Fritzsche, Sonja. "The Continuities of an East German Heimat: Gender and Technological Progress in "Du bist min. Eindeutsches Tagebuch." *The German Quarterly* 83.2 (2010): 181.

⁴⁸ Ibid.

⁴⁹ Ibid.

constraints of state approval that is). Because of its willingness to develop new technology, it led to advances in ORWO's film technology as well.

Science fiction was a popular subject matter for DEFA-produced films, and the vibrant colors offered by ORWO color film stock made it a perfect match. East Germany was eager to use feature films to erase Germany's dark past and focus on its more recent successes, such as its exploration of space.⁵⁰ The space race was a contentious aspect of the Cold War, and was reflected in many DEFA films, several of which were printed in ORWO color, to demonstrate East Germany's technological prowess and enthusiasm for progress.⁵¹ For example, although DEFA had produced one other science fiction film ten years earlier, another film, *Signale - Ein Weltraumabenteuer* (*Signals - A Space Adventure*) (1970), sparked a trend for sci-fi film in East Germany.⁵² This film was shot on ORWO color and uses it to its full advantage.⁵³ In the film, when a spaceship is hit, full screen flashes of red indicate danger.⁵⁴ Red lights in the interior of the ship sharply contrast with the blue-gray of the crew's uniform and command deck.⁵⁵ Other sci-fi films on ORWO color that followed included *Eolomea* in 1972 and *Im Staub der Sterne* (*In the Dust of the Stars*) in 1976.⁵⁶⁵⁷ Science fiction not only allowed East Germany to show its ability to keep up technologically, but also keep up with trends in filmmaking. Films like *2001: A Space Odyssey* (Stanley Kubrick, 1968) and Soviet science fiction film *Solaris* (Andrei Tarkovsky, 1972) were both popular films of the era and most likely influenced DEFA to use

⁵⁰Heiduschke, Sebastian. *East German Cinema: DEFA and Film History*. Gordonsville, VA, USA: Palgrave Macmillan, 2013. 69.

⁵¹ Ibid.

⁵² Ibid, 72.

⁵³“Signale - Ein Weltraumabenteuer (1970)” *IMDb*. IMDb.com, Inc., n.d.

⁵⁴“Signale - Ein Weltraumabenteuer, Dir. Gottfried Kolditz. Perf. Piotr Pawlowski, Evgeniy Zharikov, Gojko Mitic. VEB DEFA-Studio für Spielfilme, 1970. Film.

⁵⁵ Ibid.

⁵⁶“Eolomea (1972)” *IMDb*. IMDb.com, Inc., n.d.

⁵⁷“In the Dust of the Stars (1976)” *IMDb*. IMDb.com, Inc., n.d.

science fiction as a means of demonstrating its filmmaking skills.⁵⁸ East Germany felt that film was its most important way of reaching its people and by using a popular film subject, this could be more successfully achieved; popular film subjects would attract larger audiences. Also, science fiction film, by its very nature, both exhibits the latest technology and requires the latest technology to make. As previously mentioned, because film in East Germany was created primarily for political purposes and not for commercial reasons, the state was willing to invest large quantities of money into these projects without the promise of a profit, making them of the highest of quality.⁵⁹

Another source of propaganda in the GDR were ORWO film commercials shot on ORWO color film stock.⁶⁰ In addition to being a medium to conveying messages from the state, the ORWO brand and film stock served as a representation of the industrial independence of the GDR and its technological advances. The commercials provide us insight into products manufactured and sold within East Germany, as well as how they were used, by offering the viewer scenes of actors and dancers on film sets.⁶¹ Because all media was controlled by the state, any commercial would convey sociopolitical messages from the state to the people. Through quick cuts, the commercial draws connections between the arts, athletics, and people of all ages enjoying life in East Germany.⁶² The level of production value in the commercial also indicates the state's pride in ORWO color film stock as a product, believing that it would be a powerful message to the people, not just a means of increasing ORWO's revenue. The ORWO

⁵⁸Heiduschke, Sebastian. *East German Cinema: DEFA and Film History*. Gordonsville, VA, USA: Palgrave Macmillan, 2013. 72.

⁵⁹Ibid.

⁶⁰“FilmDokument: “From AGFA to ORWO. Corporate films from Wolfen.” *Arsenal*. Arsenal, March 2012.

⁶¹sl3media. “Vintage East German 1960's ORWO Film Commercial.” Online video clip. *YouTube*. YouTube, 6 Feb 2007.

⁶² Ibid.

advertisement was meant to appeal to the Soviet market. Their advertisements say something about what the customer wanted: color. The commercial is stylish and current with the trends (much like their sci-fi films), and hides the economic and social problems present in East Germany at the time. The OWRO commercial demonstrates to what lengths the censorship of the GDR and DEFA extended.

Films in the GDR needed to be for the people and further the soviet agenda.⁶³ Because all films had to be approved by the state and were almost exclusively only distributed to other communist nations, DEFA films produced on ORWO color film stock offer us unique insight into the political climate of East Germany. Because the art of film and politics were blurred in the GDR, the ideological messages of the Communist Party are ever present, even on the film stock itself. The vibrancy of the red tone in Agfacolor and ORWO color films is difficult to ignore, along with its political significance. While the red in prewar Agfacolor films might have reminded viewers of the Nazi Party and its ever-growing power in Europe, the red of ORWO films during the Cold War must have taken on a new significance. “Red” is synonymous with the Communist Party and the fact that the East German State had such interest in using film as a tool for propaganda mixed with ORWO’s brilliant red could not have gone unnoticed by DEFA or state officials. Here, again, the combination of the film technology and the political climate created something greater than the sum of their parts.

The reunification of Germany in 1990 led to major changes for ORWO and the film products they would continue to manufacture. It is no surprise that ORWO would struggle to survive during this time of political strife and change, as Brockmann explains the two decades following German reunification witnessed “painful... rapprochement between the two parts of

⁶³Brockmann, Stephen. *A Critical History of German Film*. Rochester, N.Y.: Camden House, 2010. 216.

Germany”.⁶⁴ While DEFA was liquidated at the end of 1992, ORWO (not being owned by the state) was briefly privatized in 1990.⁶⁵⁶⁶ However, ORWO was also unable to endure the reunification and was eventually liquidated.⁶⁷ It was not until 1998 that ORWO returned when the rights to the brand name and several of its film products were purchased by Filmotec GmbH. Filmotec still manufactures ORWO cine film in the old ORWO factory in Wolfen, but sells internationally.⁶⁸

On ORWO’s North American website, consumers can view the various film stocks still offered by the brand, but will notice that ORWO color is no longer available.⁶⁹ Perhaps this is because of the ever-growing shift to digital film production. For example, Kodak discontinued the production of its once very popular color film Kodachrome in 2009 due to a lack of demand.⁷⁰ The manufacture of black and white film would also be less labor intensive and expensive for the revived ORWO than that of color; it would not require the three layers of dye couplers. Today’s ORWO offers six types of films, one that records sounds, four with polyester bases, and two with acetate bases.⁷¹ Again, most likely due to the limited demand, the film seems to be targeted at students, offering films in several sizes, as small as 100 feet and some under 40 dollars a reel.⁷² All film stocks offered are either 16mm or 35mm.⁷³ The website also provides

⁶⁴Brockmann, Stephen. *A Critical History of German Film*. Rochester, N.Y.: Camden House, 2010. 414.

⁶⁵Heiduschke, Sebastian. *East German Cinema: DEFA and Film History*. Gordonsville, VA, USA: Palgrave Macmillan, 2013. 31.

⁶⁶ORWONA. ORWO North America, 2015.

⁶⁷ Ibid.

⁶⁸“Welcome to Filmotec.” *Filmotec Special Films*. Filmotec GmbH, n.d.

⁶⁹ORWONA. ORWO North America, 2015.

⁷⁰Suddath, Claire. “A Brief History of Kodachrome.” *Time*. Time Inc, 23 June 2009.

⁷¹ORWONA. ORWO North America, 2015.

⁷² Ibid.

⁷³ Ibid.

students and universities with special discounts.⁷⁴ Because ORWO has switched from a market dominated by political interests to commercial interests, it does not enjoy the small monopoly it once had.

ORWO's North American website explains that the film they offer today is processed in the "same exact manner as Kodak film" and that any film laboratory capable of processing Kodak film can also process ORWO film.⁷⁵ The website even includes a chart comparing each of ORWO's film stocks with its Eastman Kodak equivalent.⁷⁶ One ORWO film, ORWO UN54, compared to Eastman Plus X, has a protective gelatin layer, its emulsion layer, a subbing layer to allow the emulsion to better adhere to the base, then its triacetate base, and is backed with an antistatic back layer.⁷⁷ It is available in 35mm and like most of today's ORWO films, features a single row of perforations which follow the Bell and Howell perforation standard.⁷⁸ It is a panchromatic black and white negative film that can also be processed as a reversal.⁷⁹ This film, also like most of today's ORWO films, used the Kodak Key Code for its edge code.⁸⁰ This sort of standardization with other types of film stocks and film manufacturers is very different than the practices of the original ORWO company of East Germany. It demonstrates the great isolation the GDR faced and how limited ORWO stock was in its distribution and use throughout most of the world. Today, although still based in Germany, ORWO faces none of these restrictions and therefore benefits from following the standards of other film companies. Below

⁷⁴ Ibid.

⁷⁵ Ibid.

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ Ibid.

⁷⁹ Ibid.

⁸⁰ Ibid.

includes ORWO's film comparison chart with Eastman Kodak film. Also included is an image of the Kodak edge code that ORWO uses today.

ORWO Film vs. Eastman Film
A film comparison chart

ORWO Film	Eastman Kodak Film
Cinematography ORWO UN54 (100 ASA) Universal Negative can be processed as a reversal film.	Eastman Plus X (80 ASA)
ORWO N74plus (400 ASA)	Eastman Double X (250 ASA)
Print Film ORWO PF2 Acetate	Eastman fine grain release positive film 5302/7302
ORWO PF2 Polyester	Kodak Black-and-White print film 2302/3302
Duplicate Film ORWO DN2 Acetate	Eastman fine grain duplicating panchromatic negative film 5234/7234
ORWO DN21 Polyester	Eastman fine grain duplicating panchromatic negative film ESTAR Base 2234/3234
ORWO DP3 Acetate Panchromatic	Eastman fine grain duplicating positive film 5366/7366
ORWO DP31 Polyester Panchromatic	Eastman fine grain duplicating positive film 2366/3366 not panchromatic
Sound Recording Film ORWO TF124 Orthochromatic, Clear Base	Eastman sound recording film 2378/3378 orthochromatic, grey base
	Possible Alternative 1: Kodak panchromatic sound recording film 2374/3374 panchromatic, grey ESTAR base
	Possible Alternative 2: Kodak panchromatic sound recording film 2376 panchromatic, clear-ESTAR Base

EASTMAN KODAK DATE CODE			
1922	1942	1962	●■
1923	1943	1963	●▲
1924	1944	1964	▲■
1925	1945	1965	■●
1926	1946	1966	▲●
1927	1947	1967	■▲
1928	1948	1968*	●●●
1929	1949	1969	+
1930	1950	1970	▲+
1931	1951	1971	●+
1932	1952	1972	■+
1933	1953	1973	▲▲
1934	1954	1974	++
1935	1955	1975	+■
1936	1956	1976	●
1937	1957	1977	■
1938	1958	1978	▲
1939	1959	1979	●●
1940	1960	1980	■■

<http://www.orwona.com/film-processing/>

<http://www.rmm3d.com/3d.encyclopedia/formats/on.film.html>

Surprisingly, although ORWO color film is no longer manufactured, there is a new movement to salvage found ORWO color film stock. Retailers on websites like Etsy.com and Ebay.com either sell found rolls of ORWO film, or take reels of expired ORWO color film (for example ORWO color NC3), cut it into shorter sections, and repurpose it for still photography.

⁸¹⁸² Some sellers claim to use developing processes meant for Kodak film, but enjoy the

⁸¹“Vintage ORWO Chrom UT15 16mm 30.5m 100ft Movie Film.” Expired. 02.1988 Sealed.”eBay. eBay Inc., n.d.

⁸²“5 rolls x 120 ORWO NC19 Color Film.” Etsy. Etsy, Inc. n.d.

experimental results.⁸³ What is interesting is that although much of this film is expired, there seems to be resurgence in demand for this rare film. Perhaps it is because it is no longer available and people are interested in it as a rarity. No matter the reason, it seems to have taken 30 years for this special film stock to finally reach the western world.

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Works Cited

“5 rolls x 120 ORWO NC19 Color Film.” *Etsy*. Etsy, Inc. n.d. Web. 6 Nov 2015.

This retailer shows vintage photographic color ORWO film that is available for sale, unused, although expired.

Allan, Sean. *DEFA: East German Cinema, 1946 – 1992*. New York: Berghahn Books, Incorporated, 1999. Print.

⁸³Rothstein, Lance Aram. “Film.” *Labeauratoire*. Lance Aram Rothstein, n.d.

This publication offers historical background on the beginnings of DEFA and the government's great involvement in film production in East Germany as a means of propaganda.

Andrew, Dudley. "The Postwar Struggle for Color". *Cinema Journal* 18.2 (1979): 41–52. Web. 20 October 2015.

Offers brief information on the changing attitudes towards Agfacolor film in the western world following World War II. It also explains how technologically advanced and aesthetically pleasing Agfacolor was compared to other color films available at the time.

Berghahn, Daniela. "East German Cinema After Unification." *German Cinema: Since Unification*. Ed. David Clarke. London: Continuum, 2006. 78 – 103. Print.

This book offers some information on the poor conditions in East Germany and the lack of film equipment that was sometimes an issue during production. More germane to my research, it explains that ORWO color film stock was a best selling brand in Eastern Europe during the Cold War.

Brockmann, Stephen. *A Critical History of German Film*. Rochester, N.Y.: Camden House, 2010. Print.

Although this source does not directly reference ORWO film stock, it does offer a broad overview of post-war East German cinema. It highlights the level of censorship and lack of circulation of DEFA films. This helps explain why ORWO film stock was never widely used, and only began circulating after German unification in 1990.

Coe, Brian. *The History of Movie Photography*. Westfield, NJ: Eastview Editions, 1981. Print.

This history offers a background to ORWO by explaining the developments in German film technology. Specifically, it discusses the breakthrough in color technology with Agfacolor, developed during World War II. It also offers information on the few competing film formats, such as Sovcolor.

Enticknap, Leo. *Moving Image Technology from Zoetrope to Digital*. London: Wallflower Press. 2005. Print.

This book offers a basic overview of the transition from Agfa to ORWO, while also offering some specific information. For example, it explains that ORWO's black and white film stock was a best seller in Eastern Europe.

"Eolomea (1972)" *IMDb*. IMDb.com, Inc., n.d. Web. 10 Oct 2015.

This website indicates the production *Eolomea* was filmed on ORWO color film stock. This information furthers the idea that DEFA was interested in science fiction. However, the website's sources are unclear, making it less reliable.

“Film Specifications.” *Kodak*. Kodak, n.d. Web. 16 Oct 2015.

This resource from Kodak offers specifics on the standards for the different types of perforations. This helped me determine what type of perforation was most likely used for ORWO color NC3 by comparing it to a specific Kodak film that would use the same perforations.

“FilmDokument: “From AGFA to ORWO. Corporate films from Wolfen.” *Arsenal*. Arsenal, March 2012. Web. 1 Nov 2015.

This German website translated into English offers information about ORWO commercials being filmed on ORWO color film stock. The site also furthers the notion that all film footage was to be used for state propaganda. The reliability of this site, however, is unclear as it lists no authors and is very brief.

Fisher, Maurice. “Early Agfa colour materials – researched by Michael Talbert.” *Photographic Memorabilia*. n.p., 15 May 2015. Web. 1 Nov 2015.

Provides specific information on the developing process on early motion picture Agfacolor negative film. Unfortunately, it is difficult to determine the website’s reliability because it is rarely updated and is run by one person.

Forrest, J. L. and F. M. Wing. “The New Agfacolor Process.” *Journal of the Society of Motion Picture Engineers* 29.3 (1937): 248 – 257. Print.

This source from the SMPTE explains the proprietary color formula created by Agfacolor. It offers diagrams and detailed explanations on the films physical and chemical makeup. It also demonstrates the growing interest in finding an easier color process during the mid-1930s.

Fritzsche, Sonja. “The Continuities of an East German Heimat: Gender and Technological Progress in “Du bist min. Eindeutsches Tagebuch.” *The German Quarterly* 83.2 (2010): 172 – 188. Web. 4 Nov 2015.

This publication provides an example of equipment associated with ORWO color film stock. It also demonstrates the GDR’s willingness to spend large sums of money on film projects if it would further the Soviet agenda.

Gernsheim, Helmut. *A Concise History of Photography*. Toronto: General publishing Company, Ltd., 1986. Print.

This book offers supplemental information on the proprietary chemistry of Agfacolor film, but also offers a comparison to Kodachrome film, offered around the same time. It also explains the difference between additive and a subtractive color film.

Heiduschke, Sebastian. *East German Cinema: DEFA and Film History*. Gordonsville, VA, USA: Palgrave Macmillan, 2013. Print.

This book offers specific examples of feature films produced and printed on ORWO Color. It is interesting to note that many of these feature films were science fiction, such as *Eolomea* (1972) and *In The Dust of the Stars* (1976). This source helps me contextualize the use of ORWO film in East German culture.

“How Various 3D Formats appear on-film.” *Rocky Mountain Memories*. n.p., n.d. Web. 5 Nov 2015.

This source simply offered an image of 35mm film on which I could write a hypothetical edge code that would appear on ORWO color film stock, since I was unable to find any examples for myself.

“In the Dust of the Stars (1976)” *IMDb*. IMDb.com, Inc., n.d. Web. 9 Oct 2015

This website indicates the East German film *In the Dust of the Stars* was filmed on ORWO color film stock. This fact supports the idea that DEFA was interested in science fiction as a means of propaganda. However, the website’s sources are unclear, making it less reliable.

Keiler, J. A., and G. Pollakowski. "Persulfate/Quinone Bleach - Environmental and Economic Aspects." *Society of Motion Picture & Television Engineers* 95.2 (1986): 220-3. Web.

This trade journal article offers specifications for developer formulas for ORWO film stock. It also offers developer formulas for competing film stocks, making it a valuable source for comparing film processes. This publication is special because it has specific knowledge of color processing of ORWO film. It is interesting to note that a western source obtained specifications for a film stock that was only circulated in Soviet territories concurrent with its publication date.

Loprich, Frank and Katrin Schlosser. “Cinema after the GDR’s Downfall: The Story of O-Film.” *DEFA After East Germany*. Ed. Brigitta B. Wagner. Rochester: Boydell & Brewer Inc, 2014. 123 – 130. Print.

This source offers background on DEFA’s role for the state. It explains that DEFA was the only film production company in East Germany and was state-owned and had primarily political concerns, not commercial concerns. This meant that DEFA was willing to spend a large sum of money on a project that was not likely make a profit, as long as the political message was present.

Llufrio, Jose. Interview with Martin Koerber. *Association of Moving Image Archivists*. AMIA, 2013. Web. 2 Nov 2015.

This interview on the AMIA listserv serves to explain that the developing processes between Agfacolor and ORWO color film would be very similar. Although this is not a formal interview, Jose Llufrío specifies that he worked with ORWO film in Cuba for several years.

Llufrío, Jose. Interview with Steve Greene. *Association of Moving Image Archivists*. AMIA, 2005. Web. 2 Nov 2015.

This interview offers a guide for identifying ORWO color film stock. Because Jose Llufrío mentions working with the stock for years, it is a very helpful, detailed source.

Misek, Richard. *Chromatic Cinema: A History of Screen Color*. West Sussex: John Wiley & Sons Ltd, 2010. Print.

This publication explains the beginnings of the Russian color film stock Sovcolor immediately following World War II. Like ORWO, it used the proprietary Agfacolor technology and only sold to other communist countries during the Cold War. It highlights the similarities between Sovcolor and ORWO and offers a few famous examples of films shot on Sovcolor.

ORWONA. ORWO North America, 2015. Web. 11 Oct. 2015.

ORWONA.com offers details on ORWO film products still available for retail purchase today. The website includes specifications for the film's physical and chemical makeup as well as information on the development process. This source is useful for documenting the changes that the ORWO company and its film has gone through.

Roesler, Jorg. *Economic Change and the National Question in Twentieth-Century Europe*. New York: Cambridge University Press, 2000. Print.

This source explains the split between the Agfa film company between East and West Germany. It explains that because of East Germany's economic and political position, it chose to change its name to ORWO. This text also explains the trade relations between the GDR and the western world.

Rothstein, Lance Aram. "Film." *Labeuratoire*. Lance Aram Rothstein, n.d. Web. 10 Oct 2015.

This website is a retailer of "vintage" ORWO color film stock that is no longer manufactured. It also features photographs taken with the old cine film and developed using different formulae, creating interesting results.

"Signale - EinWeltraumabenteuer (1970)" *IMDb*. IMDb.com, Inc., n.d. Web. 10 Oct 2015

This website indicates that DEFA film *Signale - EinWeltraumabenteuer* was filmed on ORWO color film stock. This information furthers the idea that DEFA was interested in science fiction. Unfortunately, the website's sources are unclear, making it less reliable.

Signale - Ein Weltraumabenteurer, Dir. Gottfried Kolditz. Perf. Piotr Pawlowski, Evgeniy Zharikov, Gojko Mitic. VEB DEFA-Studio für Spielfilme, 1970. Film.

This film offers insight into how ORWO color film stock was used in East Germany during the Cold War, both in terms of subject matter and aesthetic choices. The film provides one of several examples of DEFA-produced science fiction films.

sl3media. "Vintage East German 1960's ORWO Film Commercial." Online video clip. *YouTube*. YouTube, 6 Feb 2007. Web. 2 Oct 2015.

Although the provenance of this film is unclear, this commercial provides great insight into how ORWO color was meant to be used as a product and how the East German State used advertisements as a means of propaganda. It also features several types of ORWO products.

Suddath, Claire. "A Brief History of Kodachrome." *Time*. Time Inc, 23 June 2009. Web. 3 Nov 2015.

This article explains the relatively recent decline in the demand for color film stock, particularly Kodak's Kodachrome film. This trend might have contributed to the fact that ORWO no longer produces its color film.

"Vintage ORWO Chrom UT15 16mm 30.5m 100ft Movie Film." Expired. 02.1988 Sealed." *eBay*. eBay Inc., n.d. Web. 8 Nov 2015.

This retailer offers color cine film from East Germany's ORWO that expired over 20 years ago. This demonstrates the interest people have in this rare type of film.

"Welcome to Filmotec." *Filmotec Special Films*. Filmotec GmbH, n.d. Web. 28 Oct 2015.

This website offers information about the international shipping of ORWO film stock that is manufactured today. It also explains that the original Wolfen plant, from which ORWO derived its name, is still in use by the company.