microphone, designed to minimize subsonic low-frequency transients resulting from rapid boom movement or wind. This model is an improved version of Model SM52.[65]

A re-engineering of the original U-47 tube model, the U-47 fet (field effects transistor), a cardioid condenser microphone, was added to the line of Neumann Phantom Powered Microphones by Gotham Audio Corp. The U-47 fet was designed for studio and concert hall use.[24]

Leevers-Rich Equipment Ltd. of London has introduced a new machine based on the Leevers-Rich 8-track recorder, the J-1600 16-track studio mastering tape recorder.[66]

An all-electronic, computerized and automated audio mixing system, the Compumix, has been announced by Quad/Eight Electronics. The Compumix may be added to an existing console or mixer for fully automated mixdown.[66]

Stephens Electronics, Inc., announced availability of the Stephens 811D-103 audio recorder, a capstanless drive machine for safe handling of wide-width tape.[67] It has a patented servo system for smoother, easier tape control.

Individually mounted removable and interchangeable sound recorder reproducer units, the Multi-Track 100 series, were announced by Multi-Track Magnetics.[16]

An improved sound-effects system where each sound is on an individual modular printed circuit board that plugs into an interconnect assembly was introduced by Universal Research Labs and is called the SS-1000-A.[16]

McMartin Industries, Inc. introduced a dual-channel version, Model B-503, supplementing their B-501 monaural and B-502 stereo five-mixer audio control consoles.[37]

Kelmar Systems, Inc., announced a new solid-state theater sound system. Features include a dc exciter lamp supply and dual power amplifiers.[37]

A system involving the use of dynamic noise reduction in a circuit designed for the peculiarities of the cinema, was developed at Dax Co. for improved theatrical reproduction of 35mm optical sound.[68]

Dolby Laboratories Inc. developed the Cinema Noise Reduction Unit which reduces background noise of all kinds without affecting the integrity of the original signal.[3,4]

PHOTO-SCIENCE

The emphasis on new products is somewhat less this year than in previous years. Only one new film was introduced, as compared to three last year.

Interest in 16mm continues to be high. Considerable attention was given to the possible use of the new Eastman Color Negative II Film in the 16mm format.

Although most of the new lenses introduced in 1972 were for 35mm single-lens reflex cameras, optical developments have included improved lenses for 8mm and super 8mm cameras, with continuing emphasis on the zoom lens.

Concern for the environment reported last year in the Progress Committee Report for 1971 (*Journal*, p. 357, May 1972) continues to increase. Photographic manufacturers and laboratories are beginning to feel the first effects of the activity of the Environmental Protection Agency established in the United States in December 1970. This is evident by the approach and content of papers on chemistry and pollution abatement published during the year. Solution recovery, water conservation and recovery and silver recovery were given considerable attention. In the southern California area, the Los Angeles City Council passed two ordinances imposing separate sewer service and quality surcharge fees upon all of the commercial, industrial and governmental users of the city's sewer system. The sewer service charge ordinance was passed on 26 June 1972 and becomes effective 3 August 1973. The quality surcharge fee ordinance was passed on 24 July 1972 and has a 1 January 1973 effective date.

In a Los Angeles Chamber of Commerce bulletin addressed to all large-volume water and sewer users in the City of Los Angeles the subject of these ordinances was discussed in detail. I believe that similar such legislative action can be expected in all of the larger processing areas.—*Roderick T. Ryan*, Vice-President for Photo-Science Affairs

Film

Eastman Kodak Company announced an improved color negative film, Eastman Color Negative II Film 5247/7247, at the SMPTE 112th Technical Conference.[69] This film provides improved sharpness and grain. The exposure index is 100 for tungsten illumination and daylight illumination (using a Kodak Daylight Filter No. 85). The film also provides improved and simplified processing, Process ECN-II. The processing time is about 12 min, excluding drying time. The new solution formulation eliminates some and reduces other components in the process effluent that may be objectionable from an ecological standpoint.[23]

A comparison of the signal-to-noise ratio and sensitivity of film and the Plumbicon™ camera was made by Hayen and Verbrugghe.[70]

An improved version of the Eastman High Definition Sound Recording Film 5740/7740 was announced in France by Kodak Pathé. It can be used as a negative exposed to high density values and printed on both black-and-white and color print film.

Processing Chemistry and Pollution Abatement

Grenier[71] modified the customary method for bromide analysis to correct for the high chloride ion that might be present in laboratories that reuse their developers.

Cooley[72] compared electrolytic silver recovery with the use of the steel wool exchange system.

Beach[73] described biological growth problems in tank solutions and suggested methods of eliminating or reducing the problems.

Dearnaley and Paequin[74] reported improved methods for chemical mixing, storage and analytical test procedures whereby high percentages of most effluents are restored to replenisher condition and reused indefinitely and also discussed reclamation of the silver content from discarded film.

Kay, et al.,[75] showed that the recovery of water and heat could be accomplished by use of reverse osmosis. The process also reduced the volume of the effluent.

Gyori and Scobey[76] described a dc power supply for electrolytic silver recovery. They also described a procedure that maintains prescribed silver concentrations and produces a more efficient and economical silver recovery operation.

Hendrickson and Daignault presented a paper on October 23 at the Society's 112th Technical Conference in Los Angeles on "Treatment of complex cyanides for reuse and/or disposal," describing studies of ozonation and other techniques leading to the development of commercial installations for pollution abatement.

Terhaar, et al.,[77] reported the toxicity to fish of a simulated Ektaprint C color print process effluent. Most of the chemicals were at such a concentration that they posed little hazard to fish. However, ferrocyanide in the effluent in the presence of simulated sunlight was toxic to fish. Fish that had lived in a dilute processing effluent and were fed to mice caused no adverse effect on the mice. Data is cited showing the degree of toxicity to fish of each of 24 processing chemicals.

Bober and Cooley[78] outlined the methods and techniques for precipitating

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filtering and recovering ferrocyanide, phosphate, silver and dye couplers from waste effluents.

Childers, et al., [79] reported the protection of processing solutions against aeration provided by high salt concentrations. The effect of the higher salt concentrations is believed to be due to the lower solubility of air or oxygen.

Weyde[80] found that brown spots formed on silver images during storage could be transferred to a moist layer containing zinc sulfide. Certain components in the atmosphere favored the spot-producing reactions. A colloidal silver test material was used to make early identification of dangerous atmospheric constituents. A degree of improvement of utility of damaged records is shown for an iodide treatment.

Bober and Dagon[81] described how ozone could be used to regenerate a used ferricyanide bleach.

Eastman Kodak Company published four additional papers in their "*Information for a Cleaner Environment*" series:

S-39 concerns water conservation[82] and contains suggestions regarding the reuse of cooling or heating water, control of wash water flows, recovery of water through reverse osmosis, and the use of salt baths for reducing the amount of wash water used.

J-40 outlines a method for determining the amount of ferrocyanide in photographic waste effluents.[83]

J-41 lists in tabular form the pounds of BOD_5 per pound of Kodak photographic chemicals[84] and gives sample calculations used in estimating the pounds of BOD_5 that might be discarded into the sewer through the discharge of photographic waste effluents.

J-46 contains the text of a paper[85] given by Thomas J. Dagon to the New York Chapter of the Water Pollution Control Federation. The article originally appeared in the *Journal of the Water Pollution Control Federation.*

Baron Blakeslee Corp. published a 20-page pamphlet regarding the use of chlorinated hydrocarbons and their contribution to air pollution. Specific reference is made to the Occupational Safety and Health Standards designated as Part 1910 in the Federal Register, 29 May 1971, Vol. 36, Number 105, Part II. The pamphlet is entitled "The Occupational Safety and Health Act and How Its Regulations Affect Vapor Degreasing."

Optical Developments

Most of the new lenses introduced in 1972 were for 35mm SLR cameras, both still and zoom, representing mainly an increase in aperture and an ability to focus down to very close objects. There has also been a growing interest in 6 × 6- and 6 × 7-cm cameras and several new lenses have been announced for these larger formats.

Several new 8mm and super-8 cameras have been announced with built-in zoom lenses covering a wide range of focal lengths. Typical is the 6 to 66mm *f*/1.8 zoom lens for the Beaulieu[86] 4008-ZM2 camera, Two new zooms for 16mm have also been announced, namely the Paillard Vario Switar[15] 16 to 100mm at *f*/1.9, and the *f*/1.6 Angenieux[22,32] lens of 9.5 to 57mm focus. Century Precision[32] has now a 3.5mm *f*/1.8 fisheye lens, which is 83mm ($3\frac{1}{4}$ in) in diameter, and Karl Heitz announced a new Kinoptik 18mm *f*/1.8 Apochromat lens for both 16mm and 35mm motion-picture cameras.[27] Rank Precision Industries[87] announced the new Varotal 30 TV zoom. The lens has a 10:1 zoom range with remote control of zoom, focus and aperture; it can be focused down to as close as 46 cm (18 in). Angenieux[22] also makes a zoom lens for the Arriflex 35, 20 to 120mm at *f*/2.6.

Of the large number of new lenses announced for 35mm SLR cameras in almost every issue of the *Japan Camera Trade News*, we may notice in particular a new fisheye Nikkor[88] 6mm *f*/2.8, which covers a field of 220°, the front of the lens being over 230mm (9 in) in diameter. At the long-focus end of the range we find 300mm lenses by Konica[89] and by Topcor.[90] Leitz has announced an 800mm Telyt[28] which is 150mm (5.9 in) in diameter and 787mm (31 in) long; and Fuji[91] is making a 1000mm *f*/8 telephoto. Such long foci are, however, generally of the mirror-lens or catadioptric construction, and in this field Spiratone[92] has announced a 500mm *f*/4, a similar lens being made by Sigma.[93] There is also a 1250mm and 2000mm *f*/10 by Celestron[64,94] and a 2000mm *f*/11 by Nikon.[88] These extreme mirror telephotos are generally quite short and compact.

The fact that 35mm SLR cameras are not equipped with a rising front and swings has long been a limitation for the serious photographer. This has been overcome in the Varioflex[95] tilting lens of 65 and 100mm focus imported by Ercona. Nikon has announced a new wide-angle lens for underwater photography.[88] A large number of new zoom lenses for SLR camera have appeared during the year and are listed in almost every issue of *Japan Camera Trade News* and *Industrial Photography*. Notable is that of Konica[89] with a focal-length range from 35 to 100mm at *f*/2.8.

The new lenses for the larger 6 × 7 cm format contain built-in shutters, and range from 55 to 200mm in focal length. They have been announced in many issues of *Industrial Photography*. The various forms of the Hasselblad camera used by NASA on recent moon voyages have been described by Kammerer[96] and in a Hasselblad advertisement.[97]

In the field of high-quality copying lenses, Optical Industries Inc.[98] has announced a line of lenses for making microcircuits from 1 : 1 to 50 : 1. A new 4-in *f*/2.8 Repro Nikkor[64,99] offered for motion-picture printing from 1 : 1 to 2.5 : 1 magnification was introduced by Photo-Technical Products, Inc. The Nikkon Company and Dynascience Corp.[100] are cooperating in the production of a stabilized-image lens, using a liquid prism controlled by *X* and *Y* gyros to deflect the light.

In the field of exotic materials, it is noted that Canon[101] is able to synthesize magnesium oxide, chiefly for use in the ultraviolet; and Swiss Jewel Co. of Philadelphia[102] makes windows and lenses of synthetic sapphire for use from 0.145 to 7.0 μm. Corning Glass Co.[103] is making fused quartz Fresnel lenses up to 25 cm (10 in) in diameter.

A survey of the new lenses announced at Photokina has been given by Goldberg,[104] and there is an informative article by Denstman[105] on "Understanding Lenses." The Japan Camera Inspection Institute is using a Nikon OTF measuring machine[106] designed by Kose and Murata for testing lenses up to 70mm in diameter and between 20 and 200mm in focal length.

The problem of long-distance optical communication has been advanced by the introduction of a liquid-filled fiber-optic tube 65 μm in diameter by the Bell Telephone Laboratories.[107,108] It is claimed that a loss of only 20 dB/km has been achieved, using near infrared radiation.