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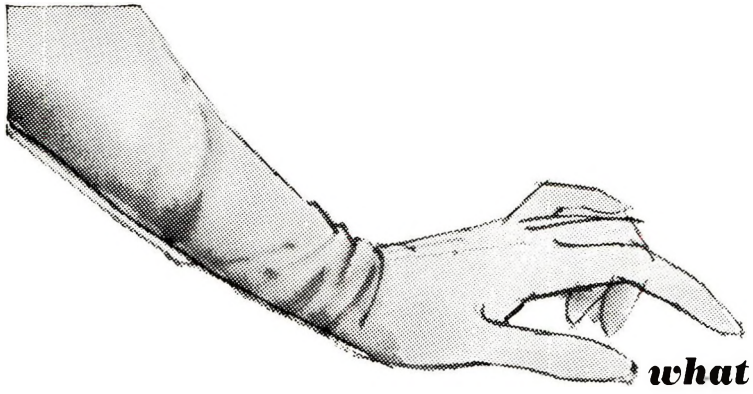

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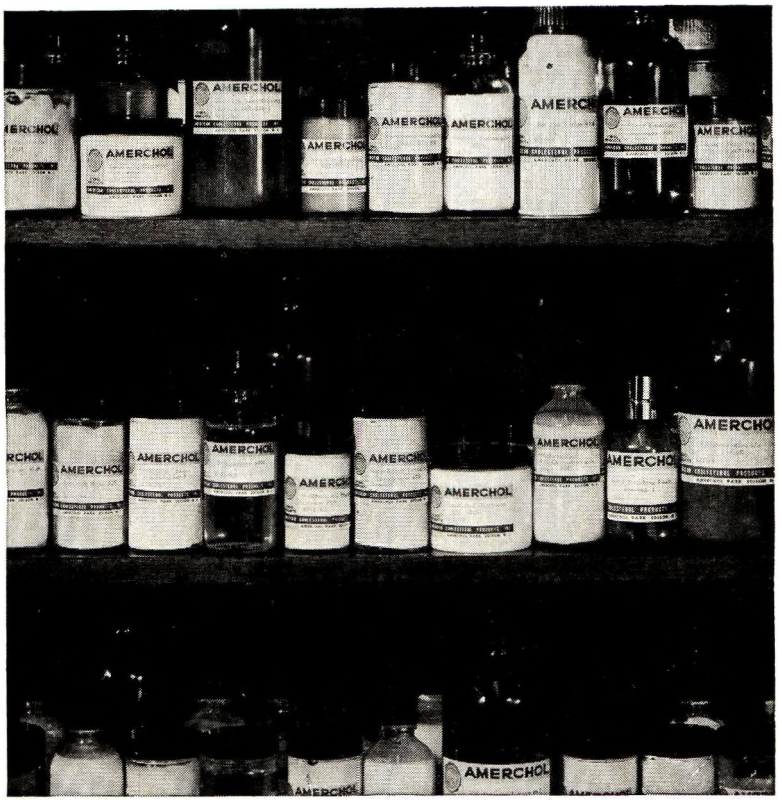

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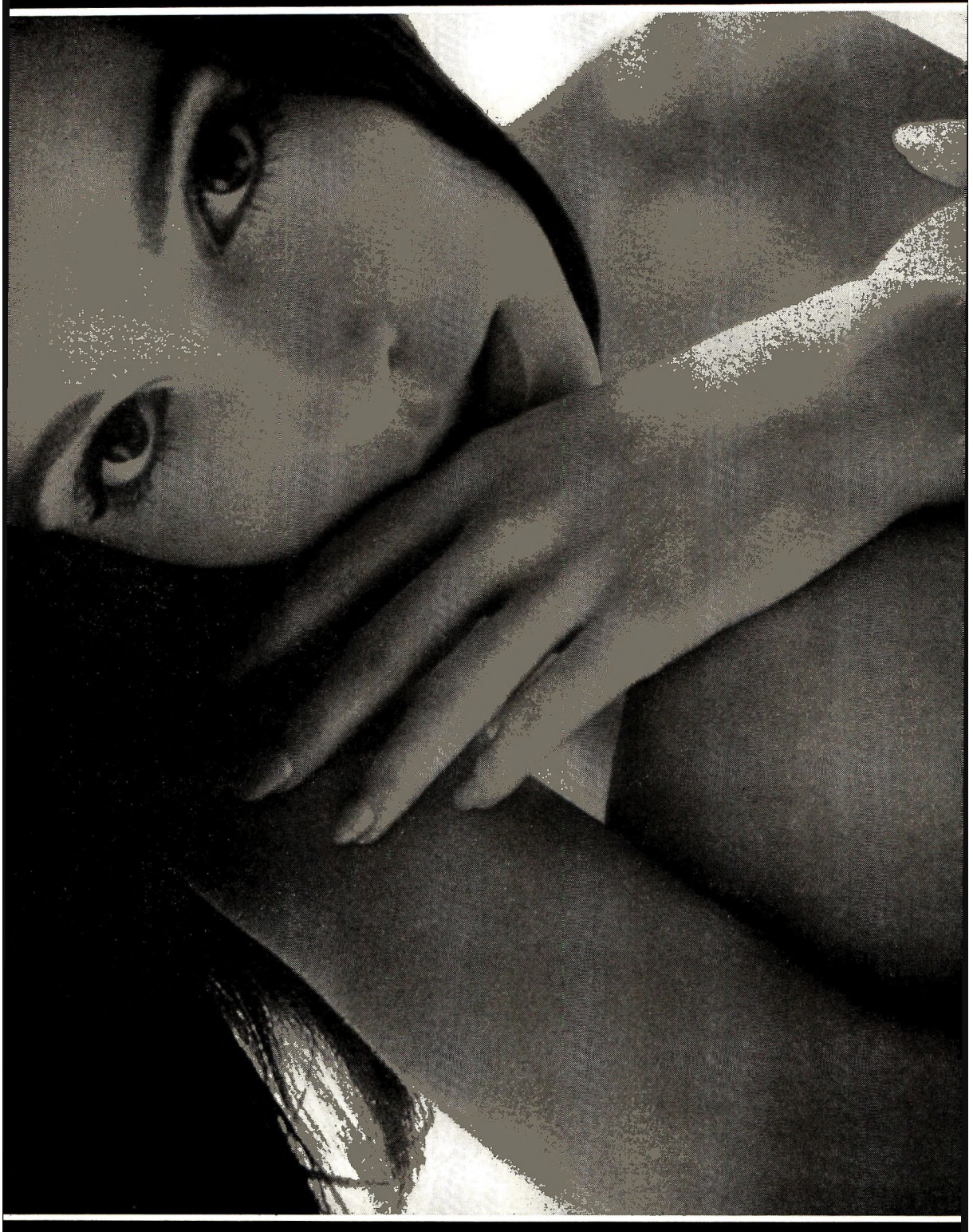

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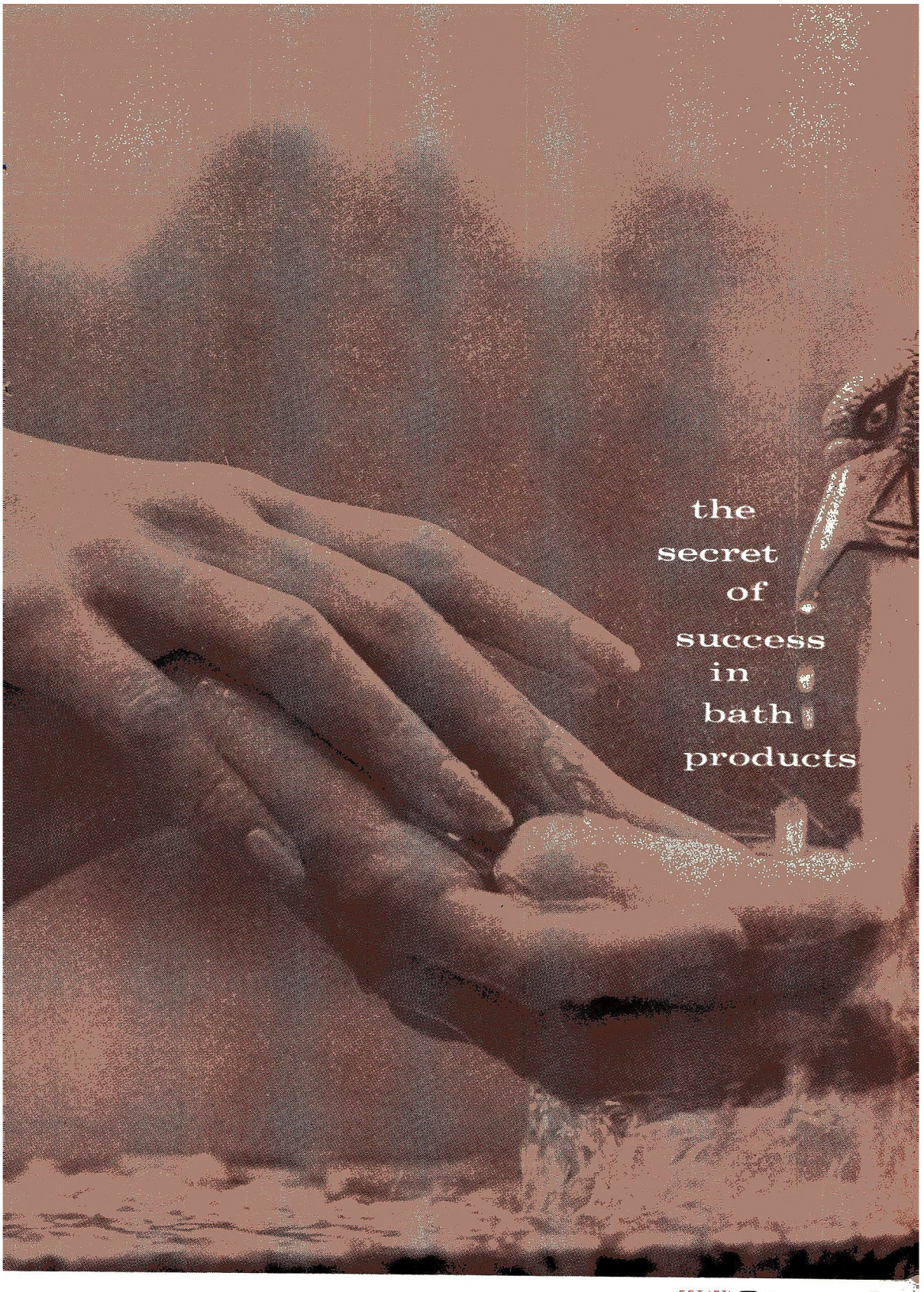

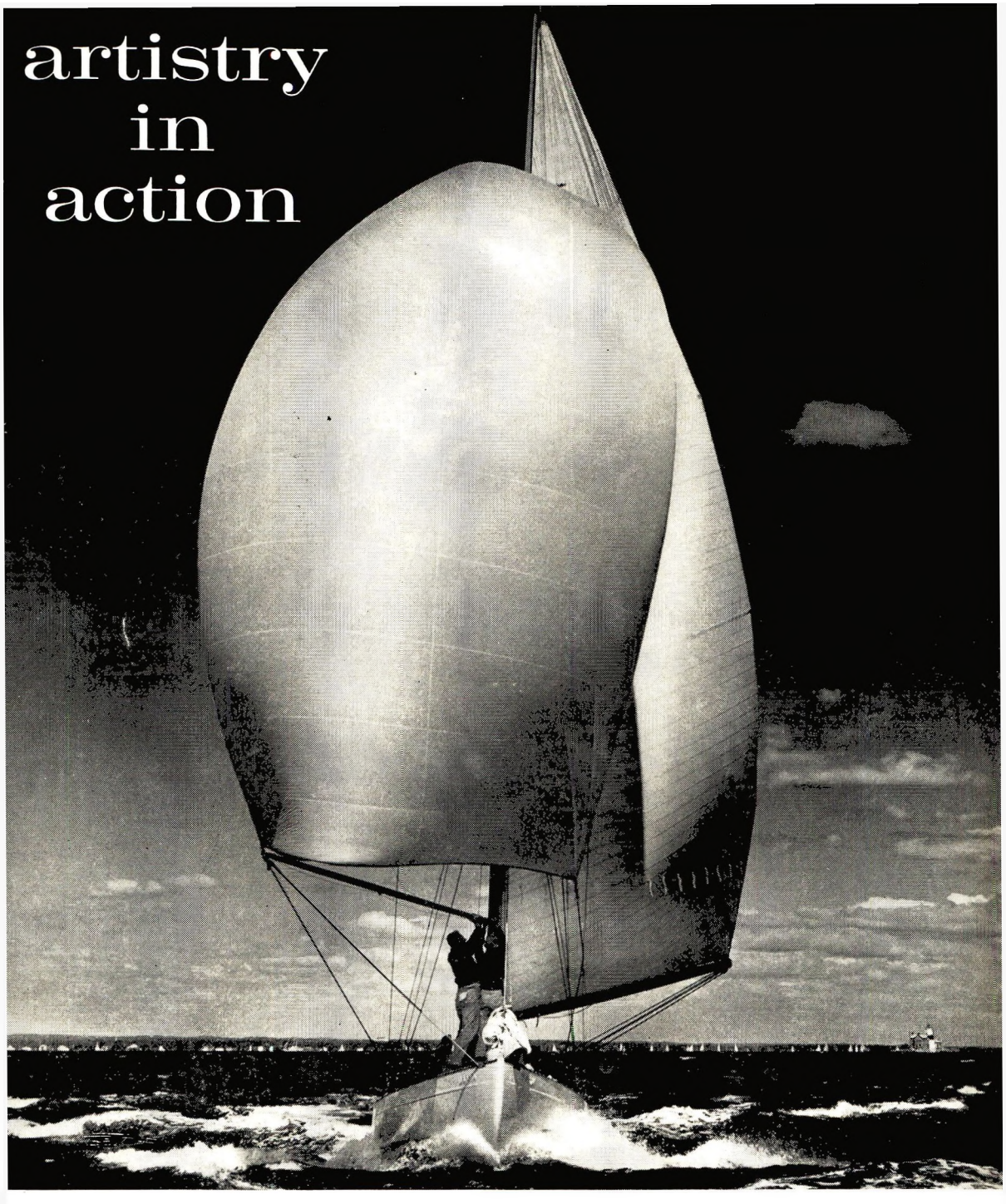

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The following synopses can be cut out and mounted on 3 × 5 in. index cards for reference, without mutilating the pages of the Journal.

An experimental design for relating personality to perfumes: Gustav Carsch. *Journal of the Society of Cosmetic Chemists* **18,** 521 (Aug. 19, 1967)

Synopsis—Fragrances are classified according to psychological effects rather than descriptive terms. A system has been devised to show perfume characteristics in a graphic form. A corresponding system serves to establish personal profiles. Fragrances and personalities are related by matching the respective patterns.

Deposition of hexachlorophene on the skin: Milton Manowitz and V. Daniel Johnston. *Journal of the Society of Cosmetic Chemists* **18,** 527 (Aug. 19, 1967)

Synopsis—Colorimetric analyses of alcoholic extracts of the skin were used to determine the hexachlorophene content of the skin after washing with hexachlorophene-containing soaps. The quantity of hexachlorophene applied was found to be a major factor controlling the amount deposited. Significant quantities of hexachlorophene were left on the skin after soaking in baths containing very low concentrations of the compound.

Keratin replacement as an aging parameter: Norman Orentreich and Nancy J. Sharp. *Journal of the Society of Cosmetic Chemists* **18,** 537 (Aug. 19, 1967)

Synopsis—The rate of nail growth diminishes in a measurable, reproducible, predictable manner with increasing age. There is a diminution in this rate of almost 40% between the ages of 25 and 95, or about 4.5 μ/week for each year of age after maturation. Young men's nails grow faster than women's until middle age but grow more slowly after the seventh decade of life. The known factors that have no effect on or that alter nail growth are enumerated. The measurement of nail growth may be a useful method of screening cosmetic preparations that may influence the nail.

Effect of topical hormones on aging human skin: Christopher M. Papa. *Journal of the Society of Cosmetic Chemists* **18,** 549 (Aug. 19, 1967)

Synopsis—The male hormone, testosterone, has a rejuvenating or ameliorative effect when applied to aging human skin. Clinically evident changes, such as effacement of wrinkles, hair growth and augmented sweating, are present but modest, particularly when compared to the improvement in the microscopic architecture of the skin. Progesterone and pregnenolone produce similar but more diminutive alterations. The female hormone, ethinyl estradiol, was without effect, while the corticosteroids accentuated the degradative changes of senescence.

The human scalp as a habitat for molds: Clayton T. Shaw and Raymond W. VanderWyk. *Journal of the Society of Cosmetic Chemists* **18,** 563 (Aug. 19, 1967)

Synopsis—Ninety molds, representing 31 different species, including four known pathogens, have been isolated from the scalps of 100 individuals known to have dandruff. The isolation methods, identifying procedures and significance of the findings are discussed.

LITERATURE SURVEY*

Analytical

Recent Advances in Automated Lipid Analysis. Levine, J. B., *J. Am. Oil Chemists' Soc.*, **44,** 95–98 (February, 1967).

Activation Analysis. Coleman, R. F., and Pierce, T. B., *Analyst*, **92,** 1–19 (1967).

Quantitative Analysis of Active Components in Ointments by X-Ray Diffractometry. I. Analysis of Boric Acid and Zinc Oxide in Ointments. Kuroda, K., and Hashigume, G., *Yakugaku Zasshi*, **87,** 148–59 (February, 1967) (Japanese).

Quantitative Analysis of Active Components in Ointments by X-Ray Diffractometry. III. Analysis of Salicylic Acid, Ethyl Aminobenzoate, and Sulfisomidin in Ointments. Kuroda, K., and Hashigume, G., *Ibid.*, 159–63.

The Photometric Titration of Fluoride with Aluminum Nitrate. Harzdorf, C., *Z. Anal. Chem.*, **227,** 161–69 (1967) (German).

Use of Activation Analysis in Problems of Drug Control. Reynolds, L. M., *et al. J. Pharm. Sci.*, **56,** 437–43 (April, 1967).

Applications of Thin-Layer Chromatography in Pharmaceutical Analyses. Comer, J. P., and Comer, I., *Ibid.*, 413–36 (April, 1967).

The Gas Chromatographic Analysis of Aqueous Solutions of the Lower Fatty Acids. Appleby, A. J., and Mayne, J. E. O., *J. Gas Chromatog.*, **5,** 211–14 (April, 1967).

The Analysis of Oils and Fats by Gas Chromatography. III. Separation Factors of Acetates, Alcohols, and Hydrocarbons. Jamieson, G. R., and Reid, E. H., *J. Chromatog.*, **26,** 8–16 (January, 1967).

An Autoanalyzer Method for Determining Hexachlorophene in Soap. Hoover, W. E., *et al.*, *J. Am. Oil Chemists' Soc.*, **44,** 175–77 (March, 1967).

Proof of *p*-Aminophenol in Hair Dyes. Konrad, E., *Parfuem. Kosmetik*, **48,** 32–33 (February, 1967).

Differentiation of Polyethylene Glycols with Reinecke Salt. XII. The Analysis of Dermatological and Cosmetic Ointment Preparations. Springer, R., *et al.*, *Arch. Pharm.*, **299,** 841–46 (October, 1966) (German).

Determination of Ephedrine and Certain Related Compounds by Ultra-Violet Spectrophotometry. Wallace, J. E., *Anal. Chem.*, **39,** 531–33 (April, 1967).

Applicability of the DuPont 900 DTA Apparatus in Quantitative Differential Thermal Analysis. Pacor, P., *Anal. Chim. Acta*, **37,** 200–08 (February, 1967).

The Use of Polyamide in Analyses of Water Soluble Food Dyes. IV. Thin-Layer Chromatographic Separation of Water Soluble Food Dyes. Davidek, J., and Davidkova, E., *J. Chromatog.*, **26,** 529–31 (February, 1967).

An Expanding Role for Gas Chromatography. Giddings, J. C., and Mallik, K. L., *Ind. Eng. Chem.*, **59,** 18–27 (April, 1967).

* Prepared by J. H. Kratochvil and H. Feinberg.

High Speed Liquid Chromatography. Smuts, T. W., *et al.*, *J. Gas Chromatog.*, **5,** 190–06 (April, 1967).

Device for Evaporation of Solvent from Small Samples. Komarek, R. J., *J. Lipid Res.*, **8,** 287–88 (May, 1967).

Bacteriology

Progress in Disinfectants and Disinfection. Chalmers, L., *Specialities*, **3,** 3–10 (February, 1967).

Inactivation of Chlorhexidine (Hibitane) by Bark Corks. Linton, K. B., *Lancet*, **7451,** 1353–55 (1966).

Incompatibility of Aluminum Stearate and Antimicrobially-Active Substances. Ritschel, W. A., *Sci. Pharm.*, **34,** 272–79 (1966).

The Interaction of Non-Ionic Surfactants with Preservatives. Parker, S., and Barnes, M., *Soap, Perfumery Cosmetics*, **40,** 163–70 (March, 1967).

Process for Combatting Microorganisms with *N*-Alkylated 1,3-Dihydroxy-2-Lower-Alkyl-2-Propylamines. U. S. Pat. 3,313,682. Filed October 19, 1964. Patented April 11, 1967. Granted to Sterling Drug, Inc.

Bacterial and Fungal Methods. U. S. Pat. 3,318,763. Filed February 24, 1964. Patented May 9, 1967. Granted to R. T. Vanderbilt Co., Inc.

Antimicrobial Agents for Topical Preparations. Faust, R. E., *Drug Cosmetic Ind.*, **100,** 44–46, 173–75 (May, 1967).

Antiseptic Iodine Complexes. Neth. Pat. 6,507,109. Published December 5, 1966. Granted to N. V. Nederlandsche Combinatie voor Chemische Industrie.

Carbanilide and Salicylanilide Soap Bacteriostats. Roman, D. P., and Manring, R. C., *Develop. Ind. Microbiol.*, 21–26 (1967).

Effects of Surfactants and Additives on the Progress of Microbiological Corrosion on Aluminum Alloys. Crum, M. G., *et al.*, *Ibid.*, 253–59.

Biological Agents as Contaminants in the Industrial Laboratory. Herman, L. G., and Powell, W. V., *Ibid.*, 298–304.

Microbiological Considerations for Pharmaceutical Aerosols. II. Sciarra, J. J., *Aerosol Age*, **12,** 45–47, 107 (March, 1967).

Morphology and Reproductive Processes of the L Forms of Bacteria. I. Streptococci and Staphylococci. Dienes, L., *J. Bacteriol.*, **93,** 693–702 (February, 1967).

Mechanisms of Enzymatic Bacteriolysis. Strominger, J. L., and Ghuysen, J., *Science*, **156,** 213–21 (April 14, 1967).

The Preservation of Shampoos. Walker, G. T., *Seifen-Öle-Fette-Wachse*, **93,** 134–35 (March, 1967).

Pitfalls in Disinfectant Evaluation. Walter, G., and Foris, S., *Soap Chem. Specialties*, **43,** 45–46, 108–09 (March, 1967).

Antibiotic Inhibition and Bindings Studies with a Group of Streptococcal L-Form. Panos, C., *et al.*, *J. Gen Microbiol.*, **46,** Part 2: 299–304 (February, 1967).

Rapid Method for the Quantitative Estimation of Microbial Lipases. Lawrence, R. C., *et al.*, *Nature*, **213,** 1264–65 (March 25, 1967).

Studies on Encapsulated Lactobacilli. III. Human Oral Strain. Hammond, B. F., *J. Dental Res.*, **46,** 340–06 (March-April, 1967).

Chemistry and Biology

Method and Apparatus for Striping and Coloring Extruded Materials. U. S. Pat. 3,311,263. Filed June 11, 1965. Patented March 28, 1967. Granted to James Harmon.

Tissue Proteins for Cosmetic Use. Cotte, J., *et al.*, *Am. Perfumer Cosmetics*, **82,** 47–58 (April, 1967).

Gels and Cosmetic Bases. Harding, W. H., *Parfum., Cosmet., Savons*, **10,** 102–07 (March, 1967).

Ideas and Experiments in Connection with the Problem of Low Temperature Emulsification. Steinitz, K. H., *Dragoco Rept.*, **13** (December, 1966).

Magnesium Salts of Succinic Esters and Emulsions Containing the Same. Brit. Pat. 1,066,758. Published April 26, 1967. Granted to L'Oreal.

The Synthesis and UV Spectra of Nitrodiphenylamine Disperse Dyes. II. The Synthesis of Some Substituted 2- and 4-Nitrodiphenylamines. Day, M., and Peters, A. T., Jr., *J. Soc. Dyers Colourists*, **83,** 137–43 (April, 1967).

Alkylbenzyldimethylammonium Chlorides. Cutler, R. A., *et al.*, *Soap Chem. Specialties*, **43,** 84, 88, 90, 92 (March, 1967).

Alkylbenzyldimethylammonium Chlorides. II. Cutler, R. A., *et al.*, *Ibid.*, 74–80, 92–96 (April, 1967).

Diffusion from Gelatin-Glycerin-Water Gels. Nixon, J. R., *et al.*, *J. Pharm. Pharmacol.*, **19,** 246–52 (April, 1967).

Emulsions and the Solvent Power of the Third Product. Rimlinger, R., *Parfum., Cosmet., Savons*, **10,** 72–78 (February, 1967).

Cinnamic Synthesis. Schofield, M., *Perfumery Essent. Oil Record*, **58,** 159–60 (March, 1967).

Degradation of Poly(Ethylene Oxides) by High-Speed Stirring. Minoura, Y., *et al.*, *J. Polymer Sci.*, **5,** Part A-2: 125-42 (January, 1967).

New Studies on Emulsion Systems. Griffin, W. C., *et al.*, *Parfum., Cosmet., Savons*, **10,** 113–20 (March, 1967) (French).

New Polymeric Emulsions for Self-Polishing Agents. Marx, E. L., *Seifen-Öle-Fette-Wachse*, **93,** 105–08 (February, 1967) (German).

Formation of Water-Oil Emulsions Stabilized by Emulsifier T-2. Ravdel', A. A., and Kozlov, G. A., *Colloid J. (USSR) (English Transl.)*, **28,** 355–60 (May–June, 1966).

The Theory of the Coagulation of Emulsions. Rice, C. L., and Whitehead, R., *J. Colloid Interface Sci.*, **23,** 174–81 (February, 1967).

The Influence of Certain Parameters on the Pressure Hydration of Propylene Oxide to Propylene Glycol. Myszkowski, J., *Int. Chem. Eng.*, **7,** 328–30 (April, 1967).

Some New Substances for the Care of the Skin. Neumann, H., *Soap, Perfumery Cosmetics*, **40,** 272, 276, 278 (April, 1967).

Menthol. Properties, Uses and Some Methods of Manufacture. Walker, G. T., *Mfg Chemist & Aerosol News*, **38,** 51–3 (March, 1967).

Consumer Products

1,5-Dihydroxy-4,8-Diamino-Anthraquinone Dyestuffs. Brit. Pat. 1,056,954. Published February 1, 1967. Granted to Farbenfabriken Bayer Akt.

Hair Dyeing Method. Can. Pat. 756,588. Published April 11, 1967. Granted to Partipharm A.G.

Color-changing Agents in Hair Cosmetics. *Dragoco Rept.*, **2,** 27–37 (1967).

Substituted Paradiaminoanisol and its Utilization for Dyeing Keratin Fibers. Fr. Pat. 1,473,843. Published March 24, 1967. Granted to L'Oreal.

Fibers. Fr. Pat. 1,473,843. Published March 24, 1967. Granted to L'Oreal.

Dyeing of Hair and Other Keratinous Materials and Diaminobenzene Compounds Therefor. Brit. Pat. 1,063,979. Published April 5, 1967. Granted to Gillette Industries, Ltd.

Compositions and Process for Dyeing Hair. Brit. Pat. 1,065,223. Published April 12, 1967. Granted to L'Oreal.

New Hair Dye and Method of Making the Same. Brit. Pat. 1,061,515. Published March 15, 1967. Granted to L'Oreal.

Hair Preparations. Markland, W. R., *Kirk-Othmer Encycl. Chem. Technol.*, 2nd Ed., **10,** 768–808 (1966).

Shampoo Composition. U. S. Pat. 3,313,735. Filed September 25, 1963. Patented April 11, 1967. Granted to Procter & Gamble Co.

Shampoo. U. S. Pat. 3,313,734. Filed May 1, 1963. Patented April 11, 1967. Granted to Procter & Gamble Co.

Copolymers for Hair Lacquer. Neth. Pat. 6,606,460. Published November 14, 1966. Granted to Oreal S. A.

Antidandruff Hair Dressing. Belg. Pat. 671,120. Published April 19, 1966. Granted to Revlon, Inc.

Permanent Wave Composition. Ger. Pat. 1,233,535. Published February 2, 1967. Granted to Wella, A. G.

Steps in Developing a Modern Lipstick. Maruszewski, A., *Am. Perfumer Cosmetics*, **82,** 37–40 (March, 1967).

Device for Retaining Artificial Eyelashes in Proper Normal Shape. U. S. Pat. 3,315,689. Filed November 15, 1963. Patented April 25, 1967. Granted to Mehron Melik.

Eyelash Cleaning Kit. Brit. Pat. 1,069,798. Published May 24, 1967. Granted to Eylure, Ltd.

Moulding Methods and Devices, Notably for the Manufacture of Lipsticks or the Like. Can. Pat. 757,549. Published April 25, 1967. Granted to Kolmar Cosmetics (Europa) A. G.

Shaving Assistant Composition. U. S. Pat. 3,314,857. Filed July 29, 1964. Patented April 18, 1967. Granted to Clairol, Inc.

Heat-Generating Shaving Composition. Can. Pat. 758,049. Published May 2, 1967. Granted to Gillette Co.

The Search for a Practical Sunscreen. Wilson, W. W., *et al.*, *Southern Med. J.*, **133,** 63–65 (1966).

Temporary Wrinkle Remover. Can. Pat. 758–050. Published May 2, 1967. Granted to Helene Curtis Industries.

Bamboo Milk in Cosmetics. Brit. Pat. 1,066,927. Published April 26, 1967. Granted to Roget et Gallet.

It's a Happening. Men's Toiletries, Sudden, Smashing, Stunning Phenomenon. *Specialities*, **3,** 27–30 (March, 1967).

Dentifrice Preparations Containing Fluoride and Quaternary Ammonium Salts. Brit. Pat. 1,068,750. Published May 10. 1967. Granted to Ciba Ltd.

OTC Internal Analgesics. Barr, W. H., and Penna, R. P., *J. Am. Pharm. Assoc.*, **NS7,** 223–25, 237–38 (May, 1967).

OTC Aids for Athlete's Foot. Duke, V. H., *Ibid.*, 226–28 (May, 1967).

Chewing Gum Containing Gas and a Medicament. U. S. Pat. 3,316,154. Filed July 12, 1965. Patented April 25, 1967. Granted to Harold M. Sellers.

OTC Antiseborrheic Preparations. Lubowe, I. I., *J. Am. Pharm. Assoc.*, **NS7**(5), 229–31, 234 (May 1967).

Preparation of a Face Lotion with a Pearly Luster. U. S. Pat. 3,320,133. Filed February 6, 1963. Patented May 16, 1967. Granted to Toyo Koatsu Industries, Inc., Tokyo, Japan.

Hair Treating Processes and Compositions (Hair Waving Composition). Can. Pat. 759,015. Published May 16, 1967. Granted to Mead Johnson & Co.

Anthraquinone Dyes for Dyeing Animal Fibers, and Method of Preparation. Fr. Pat. 1,478,780. Published April 28, 1967. Granted to Revlon, Inc.

Nitroaniline Dyes for Dyeing Animal Fibers, and Method of Preparation. Fr. Pat. 1,478,781. Published April 28, 1967. Granted to Revlon, Inc.

Progress Report on Aerosols. Kennedy, J. G., *Soap, Perfumery Cosmetics*, **40,** 247–50 (April, 1967).

Cosmetics and Toiletries. Alexander, P., *Mfg. Chemist & Aerosol News*, **38,** 48–50, 53 (March, 1967).

What is Expected from a Good Shampoo. Schweisheimer, W., *Parfum., Cosmet., Savons*, **10,** 124–26 (March, 1967) (French).

Vital Statistics on "Man" Power. *Beauty Fashion*, **52,** 55–56 (April, 1967).

Men's Market: The Second Stage. *Ibid.*, 50–4 (April, 1967).

Sun Products—The 60-Day Wonders. *Ibid.*, 34–7 (May, 1967).

The Bare Facts of Sun Control. . . Keeping Fresh in Torrid Temperatures. . . Choosing and Using Depilatories. *Beauty Fashion*, **52,** 43–46 (April, 1967).

The Negro Consumer. Gibson, D. P., *Aerosol Age*, **12,** 34–35 (March, 1967).

Protein Derivatives. Newer Applications in Aerosols and Cosmetics. Riso, R., *Ibid.*, 50, 52, 55, 57 (April, 1967).

Aerosol Quick Breaking Emulsions. I. Cooper, G. K., *Ibid.*, 32–33, 116.

Aerosol Pharmaceuticals. Sciarra, J. J., *Ibid.*, 65–66, 113.

Transparent Soap. Webb, E. T., *Am. Perfumer Cosmetics*, **82,** 41–44 (April, 1967).

Products Sweetened Without Sugar and Characterized by Freedom from After-Taste. U. S. Pat. 3,296,079. Filed December 9, 1963. Patented January 3, 1967. Granted to Chas. Pfizer & Co.

Color Keeper. *Chem. Week*, **100,** 57 (April 29, 1967).

OTC Hemorrhoidal Preparations. Grosicki, T. S., and Knoll, K. R., *J. Am. Pharm. Assoc.*, **NS7,** 223–25, 237–38 (May, 1967).

OTC Diarrhea Remedies. Ansel, H. C., *Ibid.*, 219–22 (May, 1967).

Improvements in or Relating to Razor Blades. Brit. Pat. 1,050,244. Published December 7, 1966. Granted to Wilkinson Sword Ltd.

Glycerol Ester in Cosmetic Emulsions. Atherton, J., and Maxcy, W. J., *Drug Cosmetic Ind.*, **100,** 50–54, 162–166 (March, 1967)

Comparative Evaluation of Anti-Bacterial Soaps. Jungermann, E., *et al.*, *J. Am. Oil Chemists' Soc.*, **44,** 232–34 (April, 1967).

Hair Fixatives and Hair Conditioners. I. Bergwein, K., *Seifen-Öle-Fette-Wachse*, **93,** 157 (March, 1967) (German).

Fats and Oils

The Fatty Acids of Degras. Pelick, N., and Shigley, J. W., *J. Am. Oil Chemists' Soc.*, **44,** 121–25 (February, 1967).

Modern Technology of Fats and Fatty Products. CXIV. Refining of Fats. Kaufmann, H. P., Mukherjee, K. D., *Fette, Seifen, Anstrichmittel*, **68,** 896–907 (November, 1966) (German).

Thin-Layer Chromatography in the Study of Natural Waxes and Their Constituents. Holloway, P. J., and Challen, S. B., *J. Chromatog.*, **25,** 336–46 (1966).

Emulsifiable Derivatives of Natural Waxes. U. S. Pat. 3,257,329. Filed November 13, 1961. Patented June 21, 1966. Granted to American Cholesterol Products, Inc.

Modern Technology of Fats and Fatty Products. CXIII. Fat Refining. Kaufmann, H. P., and Mukherjee, K. D., *Fette, Seifen, Anstrichmittel*, **68,** 651–59 (August, 1966) (German).

Naturally Occurring Waxes. IV. A New Type of Branched Paraffins from the Honeybee Wax. Stronsky, K., Streibl, M., and Sorm, F., *Collection Czech. Chem. Commun.*, **31,** 4694–702 (December, 1966) (German).

Studies on the Formation of Hydrocarbons in Fatty Acids and Fatty Acid Esters Irradiated with UV Rays. Luck, H., *et al.*, *Fette, Seifen, Anstrichmittel*, **68,** 1030–37 (December, 1966) (German).

Short Chain Fatty Acids (Below C_{12}) of Human Skin Surface Lipids. Kellum, R. E., *J. Invest. Dermatol.*, **48,** 364–71 (April, 1967).

Automated Gradient-Elution Column Chromatography of Lipids. Nelson, G. J., *J. Am. Oil Chemists' Soc.*, **44,** 86–94 (February, 1967)

Human Sebaceous Gland Lipids. Kellum, R. E., *Arch. Dermatol.*, **95,** 218–20 (February, 1967).

Metering Pumps. Vetter, G., and Heinsohn, F., *Brit. Chem. Eng.*, **11,** 1365–69 (November, 1966).

Apparatus for Preparation of Air Free Dispersions. Carangelo, S., and Fine, J., *Rev. Sci. Instr.*, **37,** 1733 (December, 1966).

Continuous Emulsification. E. Ger. Pat. 49,612. Published August 20, 1966. Granted to Freidrich Turnheim and Rudolf Opitz.

Water-in-Oil Emulsions. Fr. Pat. 1,443,677. Published June 29, 1966. Granted to Farbenfabriken Bayer A.G.

Laboratory Apparatus and Equipment. Edwards, J. K. P., *Pract. Maintenance and Cleaning*, **5,** 24–25 (March, 1967).

Six Tips on Processing Dry Particles. Bullock, H. L., *Chem. Eng.*, **74,** 186–88 (April 24, 1967).

Fine-Particle Technology in the Chemical Process Industries. I. Lieberman, A., *Ibid.*, 97–102 (March 27, 1967).

Fine-Particle Technology in the Chemical Process Industries. II. Lieberman, A., *Ibid.*, 209–18 (April 10, 1967).

Fine-Particle Technology in the Chemical Process Industries. III. *Ibid.*, 163–66 (April 24, 1967).

Reaction Kinetics in a Fluidized Bed. Eastburn, F. J., *Dissertation Abstr.*, **27,** Part B: 1894B (December, 1966).

Simulation of Fractional Liquid-Liquid Extraction Processes. Belter, P. A., *Ind. Eng. Chem.*, **59,** 14–21 (March, 1967).

Packaging

The Quality of Plastic Packaging for Edible Oils. Ostric-Matyasevic, B., and Markovic, V., *Rib. Ital. Sostanze Grasse*, **43,** 104–06 (1966) (Italian).

Basic Considerations of Cosmetic Packaging. Knofler, L., *Specialities*, **3,** 10–15 (April, 1967).

Storage Testing in the Cosmetic Industry. Mausner, J. J., *Ibid.*, 3–9 (April, 1967).

New Bid in Aerosols. *Chem. Week*, **100,** 57 (May 13, 1967).

Packaging in the Perfumery & Allied Trades. LXXI. A New A.B.C. Guide of Packaging Papers. II. Day, F. T., *Perfumery Essent. Oil Record*, **58,** 119–24 (February, 1967).

The Issues We Face in Carrying Out the Fair Packaging and Labeling Act. Goodrich, W. W., *FDA Papers*, **1,** 12–16 (March, 1967).

FDA Proposes Labelling Guides for Analgesics. *Advertising Age*, **38,** 1, 61 (April 10, 1967).

The Youth Market for Cosmetic Packaging. Davis, D. A., *Drug Cosmetic Ind.*, **100,** 42–43, 168–69 (April, 1967).

Extension Nozzles on Aerosols. Dater, J., *Aerosol Age*, **12,** 40, 110 (March, 1967).

Container Fill. Wolski, E. E., *Ibid.*, 31 (April, 1967).

Checking the Crimp of Glass Aerosols. Budzilek, E., *Ibid.*, 34, 37, 40 (April, 1967).

Mixtures of Aerosol Propellants Used in the U.S.A. Bergwein, K., *Seifen-Öle-Fette-Wachse*, **93,** 95–96 (February, 1967) (German).

The Application of Pharmaceutical Products in Aerosol Form. *Ibid.*, 197–98 (March, 1967) (German).

Packaging Critique. Michell, J. N., *Detergent Age*, **3,** 57 (February, 1967).

Flexibles Now "Built" to Fit Your Needs. Hannigan, K. J., *Food Eng.*, **39,** 68–71 (March, 1967)

Rigids Boast Style and Performance. *Ibid.*, 86–87 (March, 1967).

A New Breed of Aerosol "Cans." *Drug Cosmetic Ind.*, **100,** 42–43, 170–72 (May, 1967).

New Aspect of the Use of Plastic Material for Cosmetics. Locuty, P., *Am. Perfumer Cosmetics*, **82,** 29–31 (May 1967).

Investigation of the Hazards of Uncoated Glass Aerosol Containers. Ziegler, H., *Ibid.*, 33–37 (May, 1967).

Packaging in the Perfumery and Allied Trades. Part LXIII. A New A.B.C. Guide of Packaging Papers—Part IV. Day, F. T., *Perfumery Essent. Oil Record*, **58,** 256–59 (April, 1967).

'67: A Bigger Horn of Plenty for Packagers. *Mod. Packaging*, **40,** 122–27, 319, 322 (April, 1967).

Shrink Packaging Takes a New Direction. *Ibid.*, 128–130 (April, 1967).

Flexible Packaging: Something for Everything. *Ibid.*, 136–40, 281, 283 (April, 1967).

What Does Packaging Really Cost? *Ibid.*, 90–93 (May, 1967).

Laboratory Technique for Aerosols. Sokol, H. Z., *Ibid.*, 184–85, 188–90 (April, 1967).

Tubes: Aiming for Bigger Markets. *Ibid.*, 98–103 (May, 1967).

Properties of Ionomers: Coatings. Broussard, J. P., *Ibid.*, 157–61 (April, 1967).

High-Performance, Lightweight Drug Container. *Ibid.*, 136–37 (April, 1967).

Perfumes and Essential Oils

Essential Oils and Related Products. Guenther, E., *et al.*, *Anal. Chem.* **39,** 48R–68R (April, 1967).

Perfuming. Sfiras, J., *Parfum., Cosmet., Savons*, **10,** 6–9 (January, 1967) (French).

The Gamut of Perfume Notes. III. Billot, M., *Soap, Perfumery Cosmetics*, **40,** 241–46 (April, 1967).

Perfuming of Aerosols. Pilz, W., *Aerosol Age*, **12,** 24–26, 107 (March, 1967).

Perfuming of Aerosols. Pilz, W., *Ibid.*, 43, 46, 115–16 (April, 1967).

The Oil of St. John's Wort in Therapy and Cosmetics. Bergwein, K., *Perfumery Essent. Oil Record*, **58,** 164–65 (March, 1967).

Perfumer's Shelf. Kalish, J., *Drug Cosmetic Ind.*, **100,** 147–48 (March, 1967).

The Chemistry of Flavor. Hornstein, I., and Teranishi, R., *Chem. Eng. News*, **45,** 92–108 (April 3, 1967).

Artificial Oil of Lavandin. Vasic, V., *Specialities*, **3,** 14 (February, 1967).

Perfume Composition. Ger. DAS 1,234,900. Published February 23, 1967. Granted to Dr. Karl Heinz Muller.

Aspects of Functional Groups and Flavors. Kulka, K., *J. Agr. Food Chem.*, **15,** 48–57 (January, 1967).

Progress in Perfumery Materials. Bedoukian, P. Z., *Am. Perfumer Cosmetics*, **82,** 29–40 (April, 1967).

Acenaphthene Derivative and a Process for its Preparation. Brit. Pats. 1,071,012 and 1,071,013. Published June 7, 1967. Granted to International Flavors and Fragrances, Inc.

Development of the Perfumery and Cosmetic Industry in Spain. Serra, F., *Am. Perfumer Cosmetics*, **82,** 43–46 (May, 1967).

Fragrant Flower Constituents of *Osmanthus fragrans* II. Sisido, K., *et al.*, *Perfumery Essent. Oil Record*, **58,** 212–15 (April, 1967).

Fragrant Substances Employed in the Perfumery Industry of the Soviet Union. Lozzi, C., *Ibid.*, 219–22 (April, 1967).

Flash Point of Synthetic and Natural Aromatic Substances, Perfumes, Eau de Cologne, and Cosmetic Compositions. Ignat'eva, R. V., *et al.*, *Maslozhir. Prom.*, **33,** 29–32 (1967) (Russian).

Pharmacology

Information Sources for Drug Actions and Reactions. Weilerstein, R., *Ann. Allergy*, **25,** 170–72 (March, 1967).

The Search for an Analgesic. II. Balog, J., *Drug Cosmetic Ind.*, **100,** 47–53, 177–81 (May, 1967).

Synthetic Antiinflammatory Drugs: Concepts for Their Mode of Action. Domenjoz, R., *Advan. Pharmacol.*, **4,** 143–217 (1966).

Phenacetin, Through the Looking Glass. Shelley, J. H., *Clin. Pharmacol. Therap.*, **8,** 427–71 (May–June, 1967).

Pharmacological and Cosmetological Use of Aniline and Its Derivatives. Olivato, P., *Corriere Farm.*, **21,** 404–05 (1966) (Italian).

Cosmetic Substances and Allergic Rhinopathy. Bagnova, M. D., *et al.*, *Vestn. Otorinolaring.*, **27,** 27–29 (November–December, 1965) (Russian).

Experimental Studies on Pulmonary Lesions Induced by Prolonged Inhalation of Hair Sprays. Vivoli, G., *Igiene Mod.*, **59,** 67–88 (1966) (Italian).

Experimental Gingivitis in Man. Theilade, E., *et al.*, *J. Periodont. Res.*, **1,** 1–13 (1966).

Local Factors of Resistance in the Gingival Area. Brandtzaeg, P., *Ibid.*, 19–42 (1966).

The Search for an Analgesic. I. Balog, J., *Drug Cosmetic Ind.*, **100,** 38–41, 104 (April, 1967).

New Drug Products. De Haen, P., *Ibid.*, 54, 56, 58, 142, 152–9 (April, 1967).

Drug Testing Emerges as a Specialty. *Med. World News*, **8,** 81, 85 (May 5, 1967).

Toxicity May Vary with Time of Dose. *Drug Trade News*, **42,** 43, 55 (April 24, 1967).

Importance of Factorial Designs in Testing Abrasion by Dentifrices. Manly, R. S., and Foster, D. H., *J. Dental Res.*, **46,** 442–45 (March–April, 1967).

The Use of a Sustained-Release Aspirin Preparation in the Management of Rheumatoid Arthritis and Osteoarthritis. Rotstein, J., *et al.*, *J. Clin. Pharmacol.*, **7,** 97–107 (March–April, 1967).

Radiographic Evidence of Tin Uptake by Human Tooth Structure. Glass, R. L., *Arch. Oral Biol.*, **12,** 401–06 (March, 1967).

The Treatment of Psoriasis with Methotrexate. Borrie, P. F., *et al.*, *Brit. J. Dermatol.*, **79,** 73–77 (February, 1967).

The Critical Path Method in Pharmaceutical Product Development. Stavely, H. E., *Res. Management*, **10,** 91–105 (March, 1967).

The Preparation and Evaluation of Selected Aspirin-Ion Exchange Resin Adsorbates for Sustained Release. Faust, R. F., *Dissertation Abstr.*, **27,** Part B: 2760-B (February, 1967).

Heat as the Cause of Dental Decay. Taylor, S. W., *Lancet*, **1,** 949–50 (April 29, 1967).

Mineral Composition of Human Dental Calculus. Gron, P., and van Campen, G. J., *Helv. Odont. Acta.*, **11,** 71–4 (April, 1967).

Partition Coefficients of Acetylsalicylic Acid and Salicylic Acid. Thompkins, L., and Lee, K. H., *Federation Proc. Abstr.*, **26,** 619 (March–April, 1967).

Mode of Anticholinergic Action of Local Anesthetics. Feinstein, M. B., and Paimre, M., *Nature*, **214,** 151–3 (April 8, 1967).

Density Patterns in Enamel. Weatherell, J. E., *et al.*, *Caries Res.*, **1,** 42–51 (1967).

Clinical Testing. Synopsis of the New Drug Regulations. *FDA Papers*, **1,** 21–5 (March, 1967).

Skin and Hair Physiology

The First State in the Natural History of the Human Scalp Hair Cycle. Barman, J. M., *et al.*, *J. Invest. Dermatol.*, **48,** 138–42 (February, 1967).

Contact Dermatitis to a New Nail Hardener. Jawny, L., and Spada, F., *Arch. Dermatol.*, **95,** 199 (February, 1967).

A Simple In Vivo Method for Studying the Permeability of the Human Stratum Corneum. Baker, H., and Kligman, A., *J. Invest. Dermatol.*, **48,** 273–74 (March, 1967).

The Ageing of Skin. A Bioengineering Approach. Ridge, M. D., *et al.*, *Gerontologia*, **12,** 174–92 (1966).

Simplified Patch Test Screening with Mixtures. Epstein, E., *Arch. Dermatol.*, **95,** 269–74 (March, 1967).

Percutaneous Adsorption, A Critical and Historical Review. Reiss, F., *Am. J. Med. Sci.*, **252,** 588–602 (November, 1966).

Effect of Hormones on Regenerating Skin. Bukhonova, A. I., *Probl. Endokrinol. Gormonoterap.*, **12,** 113–17 (1966) (Russian).

A Method for Counting Hairs. Sarkany, I., *Brit. J. Dermatol.*, **79,** 50–51 (January, 1967).

Activation Analysis of Soluble and Fixed Sodium in Mammalian Hair. Kennington, G. S., *Science*, **155,** 588–89 (February 3, 1967).

"Beau's Lines" in Hair. Reduction of Hair Shaft Diameter Associated with Illness. Sims, R. G., *Brit. J. Dermatol.*, **79,** 43–49 (January, 1967).

The Skin: Problems of Inheritance. Larson, C. A., *Science*, **155,** 488–89 (January 27, 1967).

A Newer Approach to the Treatment of Acne. Lubowe, I. I., *Soap, Perfumery Cosmetics*, **40,** 103–04, 110 (February, 1967).

The Cystine Content of Hair: Fiber-to-Fiber Variation. Wolfram, L. J., and Lennhoff, M., *Textile Res. J.*, **37,** 145 (February, 1967).

Weathering in Human Hair. Robbins, C., *Ibid.*, 337–38 (April, 1967).

Multiple Mechanical Relaxation Phenomena in Hair Keratin. Wall, R. A., and Morgan, D. A., *Am. Chem. Soc., Div. Polymers Chem., Preprints*, **6,** 785–89 (1965).

The Ion-Binding Characteristics of a Reconstituted Collagen. Weinstock, A., *et al.*, *Biochem. J.*, **102,** 983–88 (March, 1967).

Scaliness of Human Skin. Prall, J. K., *Am. Pefumer Cosmetics*, **82,** 23–30 (March, 1967).

Enamel Wear in Deciduous Teeth with Age, Related to Surface Fluoride Content. Hargreaves, J. A., *Caries Res.*, **1,** 32–41 (1967).

Adsorption to Hydroxylapatite of Proteins and Conjugated Proteins from Human Saliva. Ericson, T., *Ibid.*, 52–8 (1967).

Studies on Collagen and Hydroxyproline. Kaplan, A., *Dissertation Abstr.*, **27,** Part B: 1780B (December, 1966).

Mitochondrial Structural Protein. Lenaz, G., *et al.*, *Federation Proc., Abstr.*, **26,** 283 (March–April, 1967).

New Methods for Determining the Chemical Composition of the Skin. Johnson, W. T. M., *et al.*, *Ibid.*, 816 (March-April, 1967).

Sensitization Testing by Human Assay. II. Kligman, A. M., *Drug Cosmetic Ind.*, **100,** 47, 49, 51–52, 159–64 (April, 1967).

Studies in Vascular Permeability of Human Skin. Kalz, F., and Feher, P. J., *Dermatologica*, **134,** 173–76 (1967).

Design of a High Intensity Monochromator. Knox, J. M., *et al.*, *Arch. Dermatol.*, **95,** 319–22 (March, 1967).

Technique for Estimating Turnover Time of Human Stratum Corneum. Baker, H., and Kligman, A. M., *Ibid.*, 408–11 (April, 1967).

Drug Reactions and the Skin Window. Larsen, W. G., *Ibid.*, 422–23 (April, 1967).

"Bound Water" in Keratin Membranes Measured by a Microbalance Technique. Scheuplein, R. J., and Morgan, L. J., *Nature*, **214,** 456–58 (April, 29, 1967).

The Variations in Imperceptible Perspiration of the Human Skin. Spruit, D., *Parfum., Cosmet., Savons*, **10,** 24–27 (January, 1967) (French).

The Metabolism and Function of Urocanic Acid in Skin. Baden, H. P., and Pathak, M. A., *J. Invest. Dermatol.*, **48,** 11–17 (January, 1967).

Preparation and Characterization of a Visible Suspension of Postembryonic Human Epidermal Cells. Briggaman, R. A., *et al.*, *Ibid.*, 159–68 (February, 1967).

Non-Collagenous Proteins of Human Dermis. Fleischmajer, R., and Krol, S., *Ibid.*, 359–63 (April, 1967).

Characteristics of Accommodated (Hardened) Skin. McOsker, D. E., and Beck, L. J., *Ibid.*, 372–83 (April, 1967).

Surface Activity

Industrial Uses of Surface Active Agents. Pueschel, F., *Tenside*, **4,** 1–8 (January, 1967) (German).

Solubilities of Ionic Surfactants in Aqueous Polymer Solutions. Saito, S. *Kolloid Z. Z. Polym.*, **215,** 16–21 (January, 1967).

The Use of Anion-Active and Non-Ionic Surfactants for Therapy and Hygiene of the Skin. Schneider, W., *Berufsdermatosen*, **13,** 257–65 (May, 1965) (German).

Aluminum Soaps. Friberg, S., *Proc. Scand. Symp. Surface Active, 2nd, Stockholm*, **1964,** 203–09 (1965).

Improving the Quality of Toilet Soap. Zelenetskoya, A. A., *et al.*, *Maslozhir. Prom.*, **32,** 17–20 (November, 1966) (Russian).

Solubilizing Rapacity of Some Synthetic Surface-Active Substances. Vervskii, B. M., *et al.*, *Ibid.*, 24–26 (November, 1966).

Relation Between Phase Inversion Temperature, Cloud Point, and HLB for Emulsions Prepared with Nonionic Emulsifiers. Mizutani, H., *Nippon Kagaku Zasshi*, **87,** 818–21 (August, 1966) (Japanese).

Effect of Electrically Charged Interfaces on the Distribution of Ions in Soap Solution. Rosano, H. L., and Feinstein, M. E., *Rev. Franc. Corps Gras*, **13,** 661–70 (November, 1966) (French).

Physical Properties of Suspensions. Smith, E. A., *Mfg. Chemist & Aerosol News*, **38,** 47–50 (February, 1967).

New Surface Active Agents Utilized in Cosmetics and Preparation Process of Said Surface-Active Agents. Belgium Pat. 676,733. Published February 8, 1966. Granted to L'Oreal.

The Use of Cationic Surfactants in Industry. I. Chwala, A., *Tenside*, **4,** 69–74 (March, 1967) (German).

Interfacial Properties of Hydrocarbons. Gillap, W. R., *et al.*, *J. Am. Oil Chemists' Soc.*, **44,** 71–73 (February, 1967).

Surface Phenomena in Dental Caries. Silverstone, L. M., *Nature*, **214,** 203–04 (April 8, 1967).

A Theory of Aqueous Emulsions. I. Negative Interfacial Tension at the Oil/Water Interface. Prince, L. M., *J. Colloid Interface Sci.*, **23,** 165–73 (February, 1967).

Monolayers Formed by Mixtures of Anionic and Cationic Surface-Active Agents. Corkill, J. M., *et al.*, *Faraday Sod. Trans.*, **63,** Part 1: 247–56 (January, 1967).

Conductance of Foam Films. Clunie, J. S., *et al.*, *Ibid.*, Part 2: 505–11 (February, 1967).

Instrument for Determining the Emulsification and Solubilizing Ability of Surface-Active Agents. Dogaru, S. M., *Int. Chem. Eng.*, **7,** 274–75 (April, 1967).

General

The Accuracy of Color Measurement. Adams, J. M., *J. Oil Colour Chemists' Assoc.*, **50,** 59–71 (1967).

Basic and Applied Research: A Meaningful Distinction? Reagan, M. D., *Science*, **155,** 1383–86 (March 17, 1967).

America's Most Profitable Companies. Weiner, J. B., *Dun's Review*, **89,** 32–33, 80 (April 1967).

Is There a Perfect Merger? Wendel, W. H., *Ibid.*, 37–8, 82 (April, 1967).

Housewife's View of Chemical Specialties. Capitman, W., *Soap Chem. Specialties*, **43,** 49–51 (March, 1967).

The Teenage Consumer. Baer, J., *Aerosol Age*, **12,** 27–29, 107 (March, 1967).

Working with the Independent Research Laboratory. Harris, L. E., and Harris, R. B., *Drug Cosmetic Ind.*, **100,** 44–46, 166–67 (April, 1967).

Ethyl Alcohol in Cosmetic and Relating Industries. Goldschmiedt, H., *Specialties*, **3,** 31–32 (April, 1967).

Do Shampoos Affect Dandruff? Alexander, S., *Brit. J. Dermatol.*, **79,** 92–95 (February, 1967).

Allergy and Cosmetics. Businco, L., *Soap, Perfumery Cosmetics*, **40,** 111–12 (February, 1967).

Designers Sound Off on the Rights and Wrongs of Creativity. *Mod. Packaging*, **40,** 146–51, 304, 307, 310, 313, 316, 318 (April, 1967).

International Patent Planning. Shipman, J. R., *Harvard Business Rev.*, **45,** 56–72 (March–April, 1967).

Are the Educators Ruining Busjness Writing? Joseph, A. M., *Res. Develop.*, **18,** 24–26 (March, 1967).

New Members

Agbay, Barbara F., 8 Whittier Pl., 2D, Boston, Mass. 02114

Antonelli, J. A., E. I. du Pont de Nemours & Co., 3500 Grays Ferry Ave., Philadelphia, Pa. 19146

Appelle, Leonard, 120 N. Broadway, Irvington, N. Y. 10533

Barada, Franc A., Fritzsche Bros. Inc., 211 S. Central, St. Louis, Mo. 63105

Blanco, Mercedes A., 2412 Surrey Ct., Chicago, Ill. 60614

Bonnett, Richard L., Whink Products Co., Eldora, Ia. 50627

Chisholm, Mary Lou, Colgate-Palmolive Co., 909 River Rd., Piscataway, N. J. 08854

Cohen, Aaron, Thomasset Color Div., 120 Lister Ave., Newark, N. J. 07105

Cummings, Irene, Monsanto Co., 800 N. Lindbergh Blvd., St. Louis, Mo. 63141

DeGrange, Charles J., Avon Products, Inc., 6901 Golf Rd., Morton Grove, Ill. 60053

Doca, Frank D., 20 Beach Park Rd., Clinton, Conn. 06413

Drucker, Jacob, Lanvin-Charles of the Ritz, Inc., 22 Elizabeth St., Norwalk, Conn. 06854

Ferencz, Murray, Warner Lambert, 120 Tabor Ave., Morris Plains, N. J. 07950

Gower, Laura E., 12130 Conway Rd., St. Louis, Mo. 63141

Greenberg, Morris N., Helene Curtis Industries, Inc., 4401 W. North Ave., Chicago, Ill. 60639

Gunther, Ellen P., Alberto-Culver Co., 2525 Armitage Ave., Melrose Park, Ill. 60160

Hartman, Carlisle G., Lander Co., 428 Adelaide, St. Louis, Mo. 63147

Hernandez, John M., Colgate-Palmolive Co., 909 River Rd., Piscataway, N. J. 08854

Kaufmann, Peter J., 3712 N. Racine, Chicago, Ill. 60613

Kleeman, Maxwell R., Union Carbide Corp., 100 Halsted St., East Orange, N. J. 07018

Koch, George, Reheis Chemical Co., 401 N. Wabash Ave., Chicago, Ill. 60611

Lazorisak, Nicholas W., DL Skin Care Products, Inc., 47 E. Market St., Buffalo, N. Y. 14204

McKavanagh, Gloria M., 3411 Wilson Ave., Chicago, Ill. 60625

Megerle, Dr. George H., The Wella Corp., 524 Grand Ave., Englewood, N. J. 07631

Messina, Ralph P., 64 Appleman Rd., Somerset, N. J. 08873

Metry, Lylla R., Ungerer & Co., 161 Avenue of the Americas, New York, N. Y. 10013

Milstead, Kenneth L., Woodard Research Corp., 12310 Pinecrest Rd., Herndon, Va. 22070

Mitra, Arun K., Lewis-Howe Co., 319 S. 4th St., St. Louis, Mo. 63102

Moday, Yitzhak, P. O. Box 16287, Tel Aviv, Israel

Mohiuddin, Mohammed, 3708 N. Ruby St., Schiller Park, Ill. 60176

Monson, James Al., 2714 La Salle St., Racine, Wis. 53402

Mosca, Gianni, 126 East Ave., Norwalk, Conn. 06851

Neiro, Manuel, Revlon International, 945 Zerega Ave., Bronx, N. Y. 10473

Norfleet, James S., Grove, Div. Bristol-Myers Products, Box 7300, Main Post Office, St. Louis, Mo. 63177

Osceta, John F., Lanvin-Charles of the Ritz, 22 Elizabeth St., Norwalk, Conn. 06854

Patel, Harikrishara M., 3868 Brittany Circle, Bridgeton, Mo. 63042

Platt, Norman E., 7001 Weil Ave., Apt. 107, St. Louis, Mo. 63119

Pogany, Istvan, Max Factor Co., 1655 N. McCadden Pl., Hollywood, Calif. 90028

Probstein, Jack, 8610 Bramble Lane, Randallstown, Md. 21133

Quick, Timothy W., Antoine Chiris Corp., 220 E. 23rd St., New York, N. Y. 10010

Rivas, Griselda, Max Factor & Co., 1655 N. McCadden Pl., Hollywood, Calif. 90028

Roberts, Dr. Eugene G., 1 Sunnyside Dr., Belleville, Ill. 62223

Rosenthal, Dr. Norman A., Bristol-Myers Co., 225 Long Ave., Hillside, N. J. 07205

Rosner, Philip, Felton Chemical Co., Inc., 9223 Park Ave., Franklin Park, Ill. 60131

Rubin, Howard, 208 Branch Brook Dr., Belleville, N. J. 07109

Ryan, Bernard P., Chas. Pfizer & Co., Inc., 630 Flushing Ave., Brooklyn, N. Y. 11206

Schlichting, Dr. David A., Carter Products Research, Half Acre Rd., Cranbury, N. J. 08512

Schneider, Emil F., American Cyanamid Co., N. Middletown Rd., Pearl River, N. Y. 10965

Schubert, Warren R., 30 Montrose Rd., Somerset, N. J. 08873

Valle, Rafael A., Revlon Research Center, 945 Zerega Ave., Bronx, N. Y. 10473

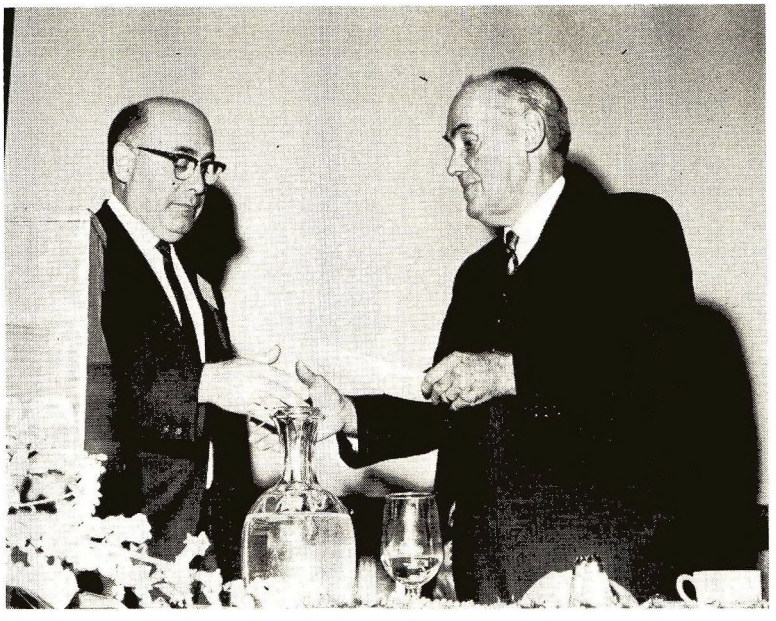
Vaniotis, Socrates V., 303 Nichols Ave., Huntington, Conn. 06484

Vassil, John C., Morgan, Finnega, Durham & Pine, 80 Pine St., New York, N. Y. 10005

Von Fenyes, Csilla K., Shell Chemical Co., 110 W. 51st St., New York, N. Y. 10019

Wise, Dr. Louis M., Bristol-Myers Co., 225 Long Ave., Hillside, N. J. 07205

Zmuda, Benjamin D., Biological Research Div. of Brunswick Corp., 11311 Hammack Dr., Bridgeton, Mo. 63042



Henry Maso (left) President of the SOCIETY OF COSMETIC CHEMISTS, presents the 1966 Literature Award to Dr. John B. Speakman of Leeds University, England

The Thirteenth Literature Award

The Thirteenth Literature Award of the Society of Cosmetic Chemists was awarded to Dr. John B. Speakman, Professor Emeritus of Leeds University, England. The presentation was made at the Literature Award Luncheon on May 2, 1967, at the Americana Hotel in New York City.

The award consists of a scroll and an honorarium of $1000. In presenting the award Henry Maso, President of the Society of Cosmetic Chemists, read the following citation: "The Society of Cosmetic Chemists presents to John B. Speakman, D.Sc., F.I.C., F.T.I., the Literature Award for 1966 for his many contributions in the field of protein fiber research and, in particular, for his investigations concerning the chemical reactivity of keratin and its relationship to permanent waving of the hair. His work is considered an outstanding contribution to Cosmetic Science."

John B. Speakman, D.Sc., F.I.C., F.T.I.

A Eulogy by Milton Harris, Ph.D.*

It is a pleasure to have the opportunity to join my friends and colleagues on this important occasion. Over the years it has been my privilege to take part in a number of these award ceremonies but none have given me more pleasure nor have filled me with more nostalgia.

It was some 30 years ago when as a young chemist embarking on a career in the science of fibers that I had the privilege to make my first trip to Europe. This was a memorable trip from a number of points of view. First, I was on my honeymoon and second, I had the opportunity to visit Leeds University, the fountainhead of wool and keratin research. Since Mrs. Harris isn't here today I suppose I can safely say that the latter was the highpoint of the trip.

Most of my visit to Leeds was spent with Professor Speakman who was then the grand old man of wool science—I think he was approximately 34 or 35 years old. Perhaps what I remembered most about my visit, in addition to the wonderful stimulation, was the comment when I told him I was very much interested in the research of wool and hair. His reply (with tongue in cheek which he does very well) was, "Young man why do you want to go into research of wool when we know all about it?" Actually from the point of view of the knowledge of the day he was probably correct. However the effect of that polite needling and leg pulling, plus the inspiration and stimulation of the visit, put me in the position of a famous car rental service—I just had to try harder.

Since that first visit I have made approximately 100 visits abroad and over the years I have kept in contact with Dr. Speakman and have also followed the progress of his work. And now some 300 papers and 50 patents later, he might still repeat his first remark to me. But somehow, proud as he is about these contributions, and indeed we are honoring him for these today, there are other accomplishments of which I am sure he is equally proud.

* Chairman of the Board, American Chemical Society.

First, he has been a leader and developer of some of the most important ingredients of modern society, the educated man, the teacher, and the scientific researcher. With some 75 advanced degree students and countless others, his record is unsurpassed in the field of textile education. I doubt if there is a major school or research organization concerned with wool or hair that has not been a beneficiary of some of these people. As a matter of fact, a research organization which bears a familiar name, the Harris Research Laboratories, is the proud possessor of five of his Ph.D. students.

Perhaps I should mention this with fear and trepidation because today there exists an emotion-packed international problem called the "brain drain" in which the United States is usually cast as the villain. Actually the United States was the beneficiary of Professor Speakman's work and many of his students before anyone ever heard of the politically-sensitive term called the "brain drain." Nonetheless, we will be prudent today and speak softly—we would not like to send our honored guest back to his native land and have him be received as something less than a conquering hero.

Without digressing, I do want to submit that the world needs more of this type of "brain drain." In a world of constant strife and poor or no communications in many areas, we in the field of science can proudly point to continued and objective dialogues in many areas and at all levels. In the long run it is my sincere belief that the pattern we are setting in the area of science will become the pattern for international communications between countries.

In addition to his contributions in the field of education, his work, as well as that of his students has had a profound effect on two major industries with which many of those here today have been associated; the cosmetic industry and the textile industry. Such developments as permanent waving, setting and hair dyeing in the cosmetic industry and shrink proofing, bleaching, dyeing and many other finishing processes in the textile industry find some roots in much of his work.

It is not too many years ago that the cosmetic industry was a purveyor of witches brews and nostrums. Nor was it too many years ago that the textile industries were largely family-held craft organizations devoid of science as we know it today. Today they are gigantic industries which boast of large research and development organizations that compare in scientific and technological sophistication with many modern industries. We as technical people can be justly proud of them

and in honoring Professor Speakman we are recognizing one of the pioneers who has made this possible.

One of the assignments of the speaker for the medalist is to present a sort of "obituary." In spite of his busy and productive life this is going to be a relatively easy task. He was born in Manchester and educated in Manchester. The rest of his working life was spent at Leeds University in many capacities. He has been a lecturer in textile chemistry, reader in textile chemistry, professor of textile industries, and emeritus professor. In addition, he has been president of the Textile Institute as well as of the Bradford Textile Society.

His awards and recognitions have been many. These include the Warner Memorial Medal, the Worshipful Company of Dyers Research Medal (three times), the Perkin Medal and honorary fellowship of the Textile Institute. In addition, he has been recognized in France, Germany, and now in the United States. In 1963 he was recognized with the C.B.E.

I have frequently said that nothing is dearer to the hearts of the worker in the field of science than the respect, the esteem, and the admiration of his peers and colleagues. Professor Speakman, you would be less than human if you were not proud and thrilled on this occasion. But I want you to know that we are equally proud and thrilled to have this opportunity to recognize your accomplishments and contributions and it is in this spirit that we are gathered here today.

1966 Literature Award Acceptance Address

PROFESSOR J. B. SPEAKMAN*

The news that I was to be the recipient of the 1966 Literature Award of the SOCIETY OF COSMETIC CHEMISTS came as a great and very pleasant surprise, and I am deeply conscious of the honor which the Society has conferred upon me. Great as is my own delight, it would have given even greater pleasure to two old friends of mine, Mr. William and Hugh MacDonald, now deceased, who may be known to some of you as the founders of MacDonald steam waving. It was through them that I came to take an interest in permanent waving processes. Hugh MacDonald was a practicing hairdresser in Inverness, who enlisted the help of his brother, William, a graduate in mathematics of the University of Aberdeen, in the development of a steam-waving process shortly after the end of World War I. In this they were so successful that the manufacture of the machines was soon transferred to London, and showrooms were opened in Regent Street in the West End. By this time Mr. William had abandoned mathematics for a business career, but he satisfied his scientific interests by following the progress of research on human hair and related fibers, such as wool. Unknown to me, he was taking a special interest in our work on one of the finishing processes of the wool textile industry, because of its close similarity to his method of permanent waving.

The process is that of "blowing" or "decatizing," in which the scoured wool cloth is stretched to the desired width, dried, and then wound with a cotton wrapper onto a perforated roller through which steam is blown for a few minutes. Unlike stretched and dried cloth, which would return to its original width on being released in cold water, the stretched, dried, and *steamed* cloth does not, and the similarity to permanent waving is obvious. The chemical mechanism of the setting (fixation) process was investigated, and by 1933 it had been shown that the permanent set which strained wool fibers acquire in steam or boiling water is due to two consecutive intramolecular reactions: disulfide bond breakdown, which dissipates stress, followed by linkage rebuilding, which fixes the relaxed structure in the strained configuration. In the

* Professor Emeritus, Leeds University, England.

light of this knowledge, low-temperature setting was an obvious possibility, especially as the first of the reactions, disulfide bond breakdown, can be carried out so easily by a multitude of reagents at ordinary temperatures.

It was at this stage of the work that I first met the MacDonald brothers. They arrived at the University without warning, explained that, as makers of permanent waving machines, they had been interested in our work on high-temperature setting, and foresaw that we might develop low-temperature methods of setting. The advent of such methods would destroy their business as machine makers and they must, therefore, be the first to develop them. This was the beginning of a long period of collaboration, in which we were joined by Dr. N. H. Chamberlain, and by the end of 1934 the first patent applications for low-temperature permanent waving had been lodged in England. One of these was based on the use of reducing agents to promote disulfide bond breakdown, followed by treatment with oxidizing agents to reform disulfide bonds and thus fix the relaxed structure in its new configuration. This early emergence of processes for permanently waving hair in the cold is due principally to the remarkable foresight of William MacDonald, and it affords an excellent illustration of the advantages which accrue from having at least one person within an industry who is able and willing to take an interest in developments outside his own specialized field.

But this is not the only, or even the main, reason for the respect in which I hold the MacDonald brothers. What this is will be clear from the following experience. During the early part of their career as makers of permanent waving machines, they had made many friendships among professional hairdressers, who were intended to have the exclusive use of the new methods of cold permanent waving. The production of "home-perm" outfits was never contemplated, and it was only when what is now one of the largest producers of such outfits sought a license to use the processes, that the MacDonalds realized the full extent of the danger to which they had exposed the professional hairdresser. After some days' consideration, they informed the firm that they could not grant a license, although they realized that this could not prevent the marketing of home-perm outfits, since only the individual user could be charged with infringement, but it was impossible for them (the MacDonalds) to profit from what they then believed would be the distresses of their friends, the professional hairdressers. The matchless

integrity which compelled so quixotic a rejection of riches will, I hope, excuse my devoting so much of this address to those friends of earlier days.

When the first of the cold permanent waving processes was invented, knowledge of the constitution and reactivity of keratin was still very primitive. It could be summarized in the statement that fibers like wool and hair consist of long, folded polypeptide chains with salt and cystine linkages between them. During the past 35 years, however, there have been great advances in understanding, based on the use of new techniques such as electron microscopy and chromatographic methods of amino-acid analysis, but without any fundamental changes in the methods of permanent waving. These are still based on reduction, followed by oxidation, and it is important to inquire why the new knowledge has found so little industrial application. For this purpose, different developments will be considered in turn.

Amino-Acid Analysis

The first complete amino-acid analyses of keratin became available in 1955 (1), but the knowledge was not as useful as was once expected, because earlier evidence that keratin is not homogeneous was reinforced by the results of electron microscope studies. The latter revealed the existence of ordered (crystalline) microfibrils embedded in a disordered (amorphous) matrix, and during the past decade much effort has been given to the fractionation of keratin, identification of the histological origin of the fractions, and to their amino-acid analysis. The most usual method of experiment has been to oxidize cystine cross linkages into cysteic acid side chains, to extract the oxidized keratin with dilute ammonia, and then fractionally precipitate the extracted proteins with acid. There is evidence to link the two main fractions with microfibrils and matrix, and some of the differences in composition are given in Table I (2).

The fact that the two fractions differ so greatly in content of cystine, lysine, and serine, all of which are now known to be involved in high-temperature setting reactions, is one of the reasons why early X-ray studies of fibers set at high temperatures showed such a difference in rate of response of the ordered and disordered regions. Because of this difference in rate of response, and also of rate of loss of set during relaxation in steam or boiling water, it became clear also that no exact understanding of the chemical mechanism of setting with different reagents could be obtained from dimensional changes alone. It was

Table I

Fraction	Percentage of Total Nitrogen			
	Cysteic Acid	Lysine	Arginine	Serine
α-keratose (microfibrils)	3.72	4.60	20.8	6.70
β-keratose (matrix)	14.5	1.03	19.0	9.70

Astbury who stressed the need to supplement the measurement of dimensional changes by X-ray examination, his most striking evidence being that a supercontracted fiber might give a disordered β-photograph, the supercontraction in such a case being due to disorientation of β-crystallites and not to loss of set by transformation of β-keratin (set keratin) into α-keratin. So far as I am aware, corresponding X-ray and dimensional studies of fibers (a) set at low temperatures and (b) afterward relaxed in boiling water have not been made. This is unfortunate, because a clear understanding of the fate of both the crystalline and amorphous regions in low-temperature setting is essential as a basis for the development of improved processes.

Amino-Acid Sequence in Keratin Fractions

The slow growth of fundamental knowledge, as well as delay in using what is available, is a more serious barrier to technical advance. All possible support should be given to determinations of the amino-acid sequence in the various fractions of keratin, because until this information is available there can be no constructive study of improved methods of cross-linking keratin, which must be the basis of improved methods of cold permanent waving. To see how imperfect is our present knowledge we need only ask why it has so far been impossible to set strained fibers with alkalies at low temperatures, using conditions which promote the formation of lanthionine cross linkages, when such setting is possible with potassium cyanide according to the following reaction scheme:

$$R{-}S{-}S{-}R + KCN \rightarrow R{-}SK + R{-}SCN \rightarrow R{-}S{-}R + KCNS$$

It seems unlikely that the answer is connected with the fact, which has emerged from recent work on the amino-acid sequence in wool keratin (3), that certain of the peptide bonds are highly sensitive to attack by alkalis. This knowledge does, however, suggest that some advantage may be found in using neutral or mildly acidic linkage-rebuilding agents with reduced keratin in the conventional low-temperature permanent

Table II

Reagent	Percentage Reduction in Resistance to 25% Extension in Water	
	Reduced Fibers	Reduced and Oxidized Fibers
Mesoxaldehyde	33.3	14.8
Dehydroascorbic acid	33.1	13.0
Pentan-2:3:4-trione	31.1	12.9
Cyclopentan-1:2:3-trione	31.1	−0.6

waving process. How effective these agents are will be seen from the results of Table II (4). The fibers were first reduced with thioglycollic acid (*M*) at pH 4.55 and 25 °C for twenty-four hours, washed overnight in running water, and then treated with a 2.5% solution of a vicinal tricarbonyl compound at 25 °C.

Internal Polymerization

As a direct consequence of the lack of knowledge of the amino-acid sequence in the keratin proteins, and the difficulty of making a constructive attack on cross-linking problems, much attention has been given to the synthesis of polymers inside animal fibers as a means of modifying their properties. Many methods have been evolved, usually for use with vinyl compounds, but in the case of permanent waving they are commonly associated with two disadvantages, swelling of the fibers and a reduction in the affinity for water; both of which harm the feel. Hydrophilic polymers are clearly desirable, and it is interesting that an aqueous solution of reductone (10%), which is slightly acidic, polymerizes inside wool fibers at 25 °C without any assistant (4). Although the polymer is hydrophilic, the resistance of the fibers to 25% extension in water can be increased by as much as 54%. Compounds of this general type are likely to find important uses in modifying the properties of keratin, at least until the results of more systematic studies of cross linking become available.

Surface Deposits of Polymer

More important than the formation of polymers inside keratin fibers at the present time, is the application of preformed polymers from solution to the surface of the fibers for the purpose of improving appearance and feel. Rapid systematic progress in this field is possible with the Stereoscan—the Cambridge scanning electron microscope. It cer-

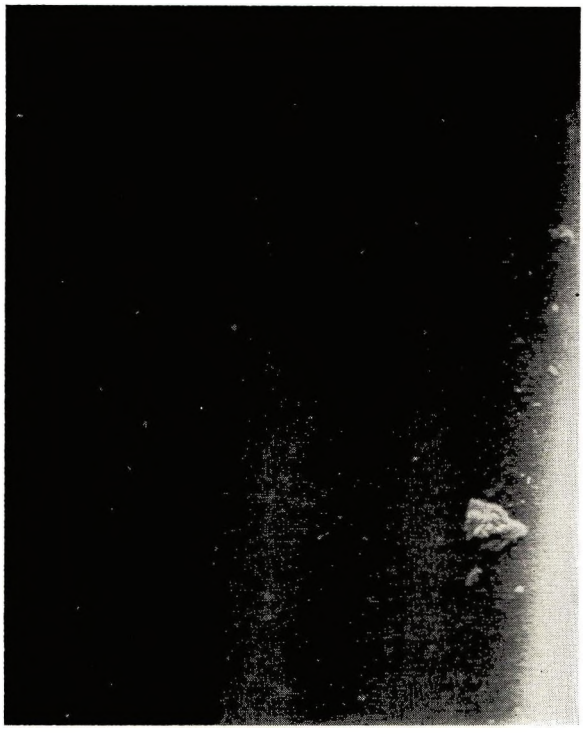


Figure 1. Electron micrograph of untreated cellulose acetate staple fiber.

tainly reveals some surprising facts, as the accompanying electron micrographs of cellulose acetate staple fiber show (5). The untreated fibers (Fig. 1) are smooth, but their feel is most unpleasant, whereas the treated fibers (Fig. 2) have a soft, vicuna-like feel in spite (perhaps, because) of the fact that the surface deposit of silicone is irregular. By means of the Stereoscan the extent to which feel is influenced by the nature and distribution of the deposit can be readily elucidated and the art transformed into an applied science.

Hydrophobic Side-Chains

Proteins like zein, which are rich in hydrophobic side chains, are remarkable in being soluble in aqueous propanol. Although the complete amino-acid analyses of wool, which were obtained in 1955 (1), revealed the presence of a high proportion of acids with hydrophobic side chains, as shown in Table III, little use has been made of the information.

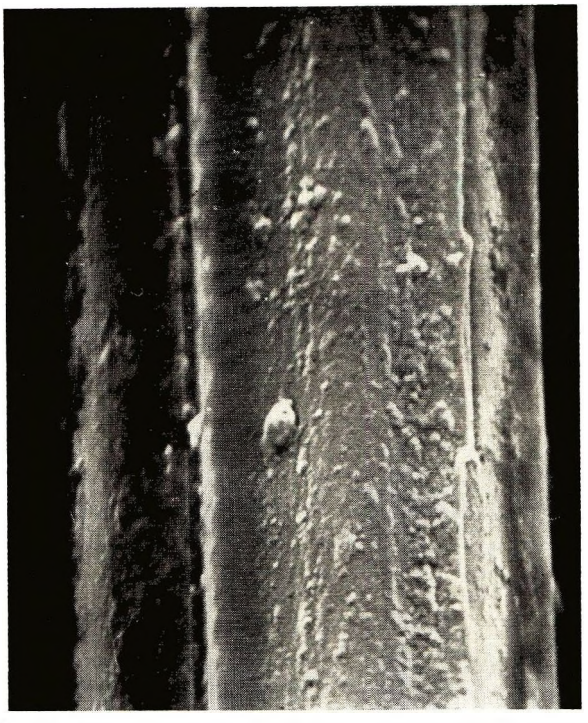


Figure 2. Electron micrograph of cellulose acetate staple fiber treated with a surface deposit of silicone

It was only in 1959 (6) that wool fibers were found to be *more* resistant to extension in water than in *n*-butanol saturated with water, and further study of the action of aqueous alcohols on wool and hair has since shown that the maximum weakening is given by an aqueous solution of *n*-propanol (45% w/w) (7). The weakening, which is associated with enhanced swelling, is clearly analogous to the dissolution of zein by aqueous propanol, and is presumably due to the action of the alcohol molecules in associating with the hydrophobic side chains of the fiber and reducing the cohesion between them. This unexpected behavior of aqueous alcohols has some bearing on solvent-assisted methods of dyeing keratin at low temperatures, and further work has revealed other new media for increasing the swelling and accessibility of wool and hair to different reagents (7). The available media cover a wide range of conditions: aqueous propanol (45% w/w) and aqueous formamide (89% w/w) are neutral, aqueous pyridine (54% w/w) is weakly alkaline (pH 8.3), and aqueous trichloroacetic acid, or, better, a solution of the acid in aqueous propanol (50% w/w) is acidic.

Table III

Amino-Acid	64s Merino Wool (Nitrogen Content as a Percentage of Total Nitrogen in Wool)
Alanine	4.12
Valine	4.16
Leucine	5.85
iso-Leucine	2.44
Phenylalanine	2.12

With these additions to the list of available swelling agents for keratin, it should be possible to ensure access of almost any type of reagent to the fine structure under conditions that ensure optimum reactivity. Similarly, means are now available for introducing fatty and waxy substances into parts of the structure of animal fibers that have not hitherto been accessible, and thus ensuring their retention under the different conditions which prevail in, for example, subsequent washing. New methods of softening, tinting, and perfuming both intact and damaged fibers must now be expected to emerge from the systematic use of mixed solvents as media for the introduction of both inert and reactive compounds.

References

(1) Simmonds, D. H., Variations in the amino acid composition of merino wool, *Proc. Int Wool Text. Res. Conference*, C 65-74 (1955); Corfield, M. C., and Robson, A., The amino acid composition of wool, *Biochem. J.*, **59**, 62–68 (1955).
(2) Corfield, M. C., Robson, A., and Skinner, B., The amino acid compositions of three fractions from oxidised wool, *Biochem. J.*, **68**, 348–52 (1958).
(3) Cassie, A. B. D., Wool Industries Research Association, Leeds University, private communication.
(4) Holker, J. R., The action of reductone on wool, Ph.D. Thesis, Leeds University (1956).
(5) Kindly supplied by Dr. J. Sikorski, Textile Physics Laboratory, Leeds University.
(6) Atkinson, J. C., Filson, A., and Speakman, J. B., Action of mixed solvents on wool, *Nature*, **184**, 444 (1959).
(7) Atkinson, J. C., and Speakman, J. B., The action of mixed solvents on wool, *J. Textile Inst.*, **55**, T433–47 (1964).

Dr. Sophie Plechner and Mrs. Eunice T. Miner Honored by SCC

The SOCIETY OF COSMETIC CHEMISTS honored Dr. Sophie Plechner at a recent advisory committee meeting. Henry Maso, President of the SOCIETY OF COSMETIC CHEMISTS, presented Dr. Plechner with an engraved plaque in appreciation for her many years of service on the advisory committee.

Mrs. Eunice T. Miner, Executive Director of the New York Academy of Sciences, was presented with an engraved plaque in appreciation for her assistance, guidance, and service to the SOCIETY OF COSMETIC CHEMISTS at its semiannual meeting in New York. Following a talk in which Robert Kramer described Mrs. Miner's extensive work with the Society, Henry Maso, President of the SOCIETY OF COSMETIC CHEMISTS, presented the plaque.

Dr. Sophie Plechner (left) of Carter-Wallace, Inc., receives a plaque from Mr. Henry Maso, President of the SOCIETY OF COSMETIC CHEMISTS

Mrs. Eunice Miner (left) of the New York Academy of Sciences receives a plaque from Mr. Henry Maso, President of the SOCIETY OF COSMETIC CHEMISTS

1966 Survey of Professional Background and Achievement of Scientists in the Cosmetic Industry

MITCHELL L. SCHLOSSMAN, PAUL THAU, and EMANUEL TRICOLI

Introduction

Professional surveys have attained long-standing recognition by large national scientific groups such as the American Chemical Society and the National Science Foundation as a means of improving the professional and economic status of their respective memberships.

In September, 1963, the New York Chapter of the Society of Cosmetic Chemists initiated the first survey of this type in our industry. This pioneering effort was well received by its membership. The initial survey was reviewed in the interim and expanded to cover the national membership of the Society of Cosmetic Chemists.

In May, 1966, some 1075 questionnaires were mailed to members of the Society of Cosmetic Chemists. Questionnaires returned by 534 individuals were used for the statistical analyses presented in this report. Respondents to this survey represented approximately 50% of the membership. Respondents to the 1966 survey were asked to list their salary with other important information about their training and employment. This data was analyzed in a preliminary way by the committee and tabulations and correlations were made possible by employing the services of Raidy Research, Inc., a data-processing firm.

Hopefully, this will provide a more complete and accurate profile of our membership in comparison with other scientific organizations.

Results

Salary Factors

In 1966, the median basic annual salary rate of those responding was between $12,000 to $15,000. Salaries ranged from $9000 or less in the lowest decile to $25,000 or more for respondents in the highest decile. The gross annual salary median was between $15,000 to $17,500.

According to data provided the American Chemical Society by the National Science Foundation, the over-all figure reported by chemists was $12,000 in 1966 (1).

Doctorates reported a median salary range of $17,500 to $20,000, Master's $15,000 to $17,500, and Bachelor's $12,500 to $15,000. In comparison, the National Science Foundation's 1966 results have Ph.D.'s at $14,000, Master's at $11,600, and Bachelor's at $10,500.

A slightly higher salary range appears to exist among those reporting income within the Middle Atlantic states, $15,000 to $17,500. On the geographic front, the Middle Atlantic states accounted for 48% of the total response. In general, the NSF data reported that the greatest proportion, 28% of chemists, were from the Middle Atlantic states—New Jersey, New York, and Pennsylvania.

A uniform progression of salary with the number of years experience in the industry is evident. The median for the number of years of total industrial experience was thirteen to twenty years. The median number of years in the cosmetic industry was eight to twelve years. A significant correlation exists between the number of technical employees supervised and the reported gross annual salary rates.

Highest Degree

Doctorates were reported as the highest degrees obtained by 21% of the respondents. Master's degrees by 17% and Bachelor's degrees by 51%. About two-thirds of the respondents have their degree in chemistry or biochemistry; 17% in pharmacy. Surprisingly, the third largest category was chemical engineering, with 8%.

Age and Sex

Thirty-nine per cent of the members responding were under the age of forty. The median age was between forty to forty-nine years of age. The median age of scientists who reported to NSF was thirty-eight, a figure that has remained constant for the past ten years (2).

The results from this data support the inference that we must find means of attracting younger scientists into our industry. Of the total number of scientists reporting to the NSF, 8% were women (2). Eight per cent of the respondents to the SCC survey were women, also.

Type of Employer

Forty per cent of those answering are employed by firms with more than 1000 employees. The median for the number of technical employ-

1966 Characteristics of Scientists in the Cosmetic Industry

Characteristics	No.	Approximate Percentage	Characteristics	No.	Approximate Percentage
Scientific field			Type of employer		
Chemistry	313	59	Private industry or business	453	84
Biochemistry	21	4	Self-employed	19	4
Pharmacy	91	17	Owner or partner	18	3
Pharmacology	8	1	Educational institution	13	2
Medicine	8	1	Student	4	1
Biology	29	5	Government	0	0
Chemical engineering	43	8	Trade association, periodical or nonprofit organization	3	1
Associate degree	5	1	Other or no response	24	5
No degree	20	4	Work activity (multiple response)		
Age (median age 40–49)			Management and administration of research and development	176	33
20–29 years	45	8	Management and administration of other than research and development	97	18
30–39 years	168	31	Research and development		
40–49 years	158	30	Basic research	96	18
50–59 years	100	19	Applied research	179	34
60–69 years	37	7	Analytical or organic research	19	4
70 and over	5	1	Biological research	9	2
No response	21	4	Report or other technical writing, editing	26	5
Highest degree			Sales	59	11
Ph.D. or D.Sc.	114	21	Technical service	91	17
M.D.	6	1	Development or design	42	8
Master's	90	17	Production, operations	53	10
Bachelor's	271	51	Inspection, testing, quality control	53	10
Less than a Bachelor's	29	6	Consulting	37	7
No report	23	4	Other and no response	51	9
Total years experience					
1 or less	8	2			
1–3	14	3			
8–12	53	10			
13–20	152	28			
20 or more	204	39			
Years cosmetics experience					
1 or less	9	2			
1–3	41	8			
8–12	104	19			
13–20	116	22			
20 or more	101	19			
Not in cosmetic industry directly	73	14			

ees reported by the members was 25 to 49. The majority of participants reported employment by finished goods manufacturers. Only 4% of the total respondents reported employment other than in private

	Median Salary Range (thousands)		Median Salary Range (thousands)
Highest degree earned		Work activity	
Bachelor's	$12.5–15	Management or administration of R & D	$17.5–20
Master's	$15–17.5	Management or administration of other than R & D	$15–17.5
Doctorate	$17.5–20	Basic "product" research	$10–12.5
Geographic location		Applied "product" research	$12.5–15
New England	$12.5–15	Analytical or organic research	Insufficient responses
Middle Atlantic	$15–17.5	Biological research	Insufficient responses
Lake States	$12.5–15	Report or other technical writing, editing	$10–12.5
West	$12.5–15	Sales	$12.5–15
All others were insufficiently represented.		Technical service	$12.5–15
Number of years experience		Development or design	$10–12
0–1	Insufficient responses	Production, operations	$12.5–15
1–3		Inspection, testing, quality control	$10–12.5
4–7	$10–12.5	Consulting	Insufficient responses
8–12	$12.5–15		
13–20	$15–17.5	Employer's principal line(s) of business	
20 or more	$17.5–20	Cosmetics and toiletries	$12.5–15
Total no. of employees		Pharmaceuticals	$15–17.5
Less than 50	$15–17.5	Chemicals, surfactants & raw materials	$15–17.5
50–99	$12.5–15	Perfumes and/or essential oils	$12.5–15
100–299	$15–17.5	Private label manufacturing	$15–17.5
300–499	$10–12.5	Testing, consulting laboratories	Insufficient responses
500–999	$12.5–15	Education and academic research	Insufficient responses
More than 1000	$15.2–15		
Number of technical employees supervised			
None	$10–12.5		
1–2	$10–12.5		
3–4	$12.5–15		
5–9	$15–17.5		
10–24	$20–30		
25–49	$20–30		
50–99	Insufficient responses		
Over 100			

industry or business. No significant trend exists between the gross annual salary rate and the size of the firms reported. The areas of the greatest work emphasis appear to be in creams and lotions, hair, and makeup products. The median number of different firms respondents were employed by was three.

Work Activity

The majority of those participating in this survey reported job responsibilities at the senior research level or higher. One-third of the

respondents were involved in some form of research and development. The NSF survey shows that 39% of the scientists reporting were involved in some phase of research (2).

A high proportion of our respondents had administrative responsibilities. The median number of technical employees supervised by respondents was three to four. Management or administration was the best-paid work activity at a median salary range of $17,500 to $20,000 as compared to $16,100 for chemists in management who reported in the 1966 NSF survey (1). It appears that about one-fifth of the respondents are involved in sales and/or technical service.

Fringe Benefits

Fifty-nine per cent reported that their employers offer educational cost sharing plans. Eleven per cent reported educational leave of absence as a fringe benefit.

Society Policy

Several questions were posed to the membership in order to evaluate future policy proposals. Seventy per cent feel that the name of the Society accurately describes the organization as it exists today—Society of Cosmetic Chemists. There is evidence that a good percentage of people within the cosmetic industry who are qualified are not presently members of the Society.

Fifty per cent of the participants in this survey were in favor of the establishment of a correspondence course for the training of new members to our industry. Forty per cent were opposed. Fifty-four per cent favor the formation of a Cosmetic Research Institute; 46% were opposed. Of those in favor, 52% suppose that their company would financially support such an institute. Sixty-seven per cent of the respondents feel that the Society should sponsor scholarships for graduate and undergraduate students working in fields related to cosmetic technology.

Forty-nine per cent favor the present three national meetings per year of longer duration. Finally, of the participants in the survey, 84% save their copies of the Journal of the Society of Cosmetic Chemists.

References

(1) Chemists' salaries continued to rise in 1966, *Chem. Eng. News*, **45**, 52–54 (January 16, 1967).

(2) Chemists' median pay: $12,000, *Ibid.*, **45**, 12 (January 2, 1967).

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An Experimental Design for Relating Personality to Perfumes

GUSTAV CARSCH*

Presented September 20–21, 1966, Seminar, New York City

Synopsis—Fragrances are classified according to psychological effects rather than descriptive terms. A system has been devised to show perfume characteristics in a graphic form. A corresponding system serves to establish personal profiles. Fragrances and personalities are related by matching the respective patterns.

In describing a fragrance, almost any perfumer will respond by naming the aromatic raw materials which he thinks are in the perfume compound. This is appropriate to his work but virtually meaningless to the consumer. Nevertheless, manufacturers persist in defining their perfumes in this manner (1).

Instead of stating what the perfume *is* (what it is made of), it is more informative to determine what it *does* (what psychological effects it exercises). To give an example from another area: if a wall paper is called "yellow," that is a plain description of the paper's color; but if it is called "cheerful," that is a description of the *effect* the color has on the beholder.

The effect of any work of art—and perfume is no exception—depends on the use of contrasts, on the opposites joined to create an entity. One of the finest symbols of this principle is the Chinese sign of Yang and Yin representing day and night, male and female, etc.

Fragrance Profile

The system worked out for this fragrance classification relies on the principle of polarity and utilizes Jellinek's work (2–3).

* Fleuroma, 43–23 Thirty-seventh Avenue, Long Island City, N. Y. 11101

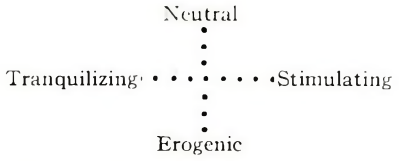

Figure 1. Psychological effects of fragrance

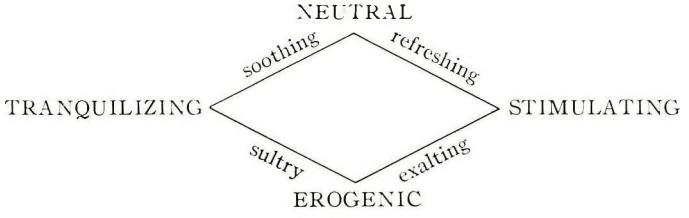

Figure 2. Psychological effects of fragrance

The first psychological effect of fragrance to be considered is whether it is erogenic or not. Erogenic, of course, is a coined word which simply means having sex appeal. For the opposite of sex appeal, the word neutral is used. The next consideration concerns the contrast between stimulating and tranquilizing effects. If these two contrasts are arranged in vertical and horizontal opposition, a cross pattern is obtained (Fig. 1). The four major effects can then be combined in different ways. By connecting the four points, a diamond is formed (Fig. 2), and additional effects are derived from the combinations of stimulating with erogenic, stimulating with neutral and tranquilizing with erogenic or with neutral. The resulting effects, as seen on opposite sides of the diamond, i.e., refreshing *vs.* sultry and exhalting *vs.* soothing, conform again to the principle of polarity.

The scheme now comprises eight psychological effects of fragrances, opposed to polarity but also capable of forming a continuous odor spectrum by following the perimeter of the rhombic figure.

Next is the crucial step of aligning actual fragrances with the range of psychological effects. Figure 3 illustrates where some well-known odor types belong on the chart. This assignment is based on Jellinek's theory (2, 3), even though there is as yet no valid scientific evidence that Jellinek's system is true. Nevertheless, it can serve as a basis for the development of Fragrance Profiles for finished perfumes or colognes. It must be emphasized that a fragrance creation is called a compound or a composition, which expresses the fact that it is made up of many elements which together produce a unique entity. Then—

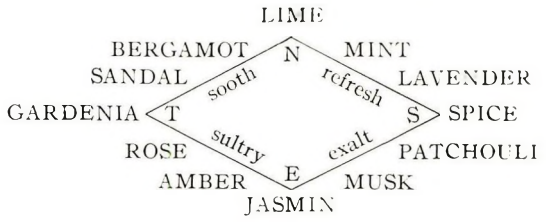

Figure 3. Representative perfume materials placed according to effects

how does one go about charting a fragrance profile? One searches for the area of greatest emphasis and marks it prominently on the appropriate place alongside the perimeter of the diamond pattern. Next, the secondary accents are indicated but not as outstanding as the main element.

To illustrate practical application, here are a few examples of Fragrance Profiles. Figure 4A represents Perfume A, which in the parlance of "what it is" would be described as "modern-floral", "floral" because it contains a lot of flower oils or corresponding aromatics, and "modern" as a consumer-oriented synonym for higher fatty aldehydes, which are another and distinctive ingredient. In terms of psychological effects, this fragrance encompasses all, but the prominent effect is erogenic (jasmin and aldehydes). It leans somewhat to the exalting (musk) but a little more towards the tranquilizing (rose). This relative roundness, the absence of drastic contrasts or extremes, and the mild emphasis of the effects most generally desired from perfume may well explain the great popularity of this fragrance type.

Figure 4B describes a different story. Perfume B shares the erogenic effect with Perfume A, but the emphasis is on stimulating and fresh (spice and lavender). Nothing of a sultry or tranquilizing nature is found in this fragrance.

Figure 4C illustrates emphasis on the opposite side. Perfume C has its erogenic and exalting components, but the prominence is in the area of sultry (amber and vanilla), which would be unbearable and artistically unsatisfactory if it were not balanced by a strong secondary accent in the soothing-neutral region (bergamot).

Finally, Fig. 4D gives the profiles of an exceptional fragrance product, one without any erogenic effects. Classical cologne is refreshing (citrus) and soothing (bergamot); it leans a little to the tranquilizing side (neroli) but is sexually neutral. Thus men as well as women and even children can use it quite properly.

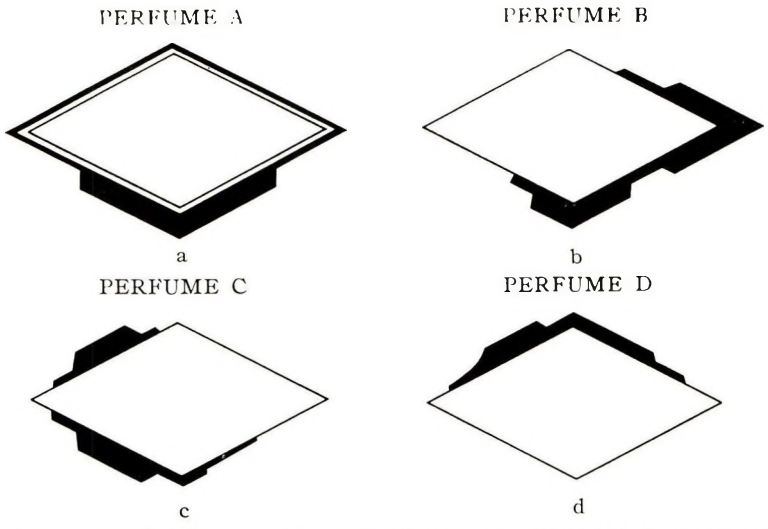

Figure 4. Fragrance Profiles; a—modern/floral bouquet; b—fresh/spicy/modern/floral; c—oriental; d—classical eau de cologne.

These examples are sufficient to demonstrate the principle involved. There is, theoretically at least, a specific fragrance profile for every original perfume.

Personality Profile

Up to this point, a method for classification of fragrances has been established, and a graphic system for its notation has been shown. How can these fragrance profiles be related to personalities?

The method consists of identifying the personality elements which need to be considered in a manner analogous to that used for the Fragrance Profiles. Polar definitions must be set up and placed at opposite corners of the diamond pattern to obtain corresponding Personal Profiles. It has been shown three elements are required for designing Personality Profiles (4, 5).

The first factor is called *personality* (Fig. 5A). At the top and bottom corners of the diamond are found natural and sophisticated, at the right and left corners independent and compliant. In order to establish the profile, the preferred one of each of the two pairs is checked.

The next factor is called *temperament* (Fig. 5B). Exactly the same principle of juxtaposition is applied: cool *vs.* warm and vivacious *vs.* calm.

The last factor is called *dress* (Fig. 5C), which should be understood to incorporate all aspects of outward appearance such as makeup and

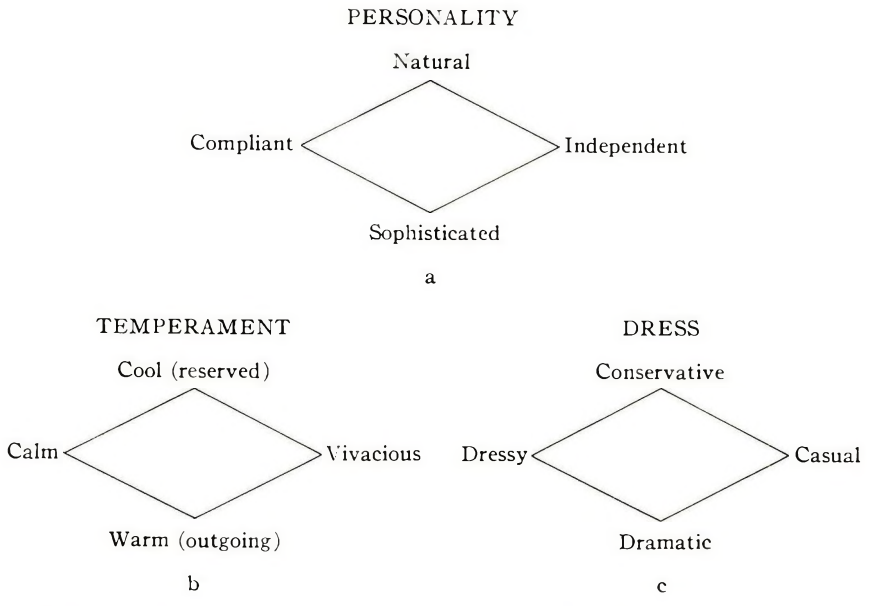

Figure 5. Personal Profile elements; a—personality; b—temperament; c—dress.

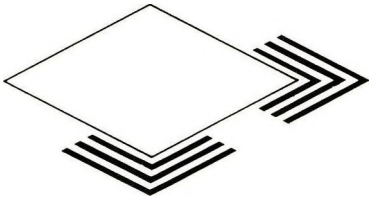

Figure 6. Personal Profile; elements combined: independent/sophisticated; vivacious/warm; and casual/dramatic.

hair style: conservative as opposed to dramatic, and casual *vs.* dressy. Here again, one each of the opposing preferences is to be checked, yielding those applicable to the occasion for which the perfume is to be used.

Figure 6 demonstrates how a completed Personality Profile might look. From the personality chart the elements of independent and sophisticated have been selected; from the temperament chart, vivacious and warm are the choices. Finally, the fragrance is to be worn with a dress that is both casual and dramatic.

The resulting pattern is rather one-sided, with all the emphasis on the right-hand and bottom corners, but is nevertheless not unusual. This pattern (Fig. 6) is similar to the Fragrance Profile demonstrated in

Fig. 4B. The conclusion is, of course, that Perfume B would be a happy and appropriate choice for a woman with the Personal Profile of Fig. 6.

For the purpose of explaining this principle it is sufficient to cite only one example. Actually, 16 different Personal Profiles can be obtained, using all possible combinations of the various elements described above.

Discussion and Summary

It has been asked—what happens if the individual selecting the Personal Profile pattern is not "truthful?" The answer is: "It doesn't matter," because the question misses the point. The point is that a suitable fragrance can be found to parallel a given Personality Profile, whether this reflects the "real self" or the "desired self." Since role-playing is an integral part of our social lives, it is perfectly legitimate to select fragrances—the ultimate accessories—as props to support chosen roles. The whole idea of relating personality characteristics to fragrance effects is meant to serve as a guide to the selection of suitable perfumes from an otherwise bewildering and confusing multitude of choices. The outlined system can achieve this better than any other merely verbal ingredient-descriptive way of recommendation.

A small commercial, not scientific, experiment has been conducted by Custom Fragrance Corp., in which eight fragrances, designed for different psychological effects, were made available. Also available were printed materials for the charting of Personality Profiles and comparison with Fragrance Profiles. The practical experience of the custom fragrance project was satisfactory and encouraging. Many participants were intrigued by the procedure and pleased with the results.

It is hoped that additional studies of the relationship between fragrance-type and personality traits will shed further light on this subject.

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References

(1) *Dictio Parfums, Dictionnaire des Parfums de France*, "Les Editions 26," Paris, 1964.
(2) Jellinek, P., *Praktikum des Modern Parfumeurs*, Urban & Schwarzenberg, Wien, 1949.
(3) Jellinek, P., *Die Psychologischen Grundlagen der Parfümerie*, Dr. Alfred Hüthig Verlag, Heidelberg, 1951.
(4) Carsch, M. A., *How to Select Your Perfect Perfume*, © 1959, Published by the Author
(5) Carsch, M. A., *Discover the Perfume to Fit Your Personality*, © 1961, Custom Fragrance Corp.

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Deposition of Hexachlorophene on the Skin

MILTON MANOWITZ, Ph.D., and V. DANIEL JOHNSTON, B.S.*

Presented November 30, 1966, New York City

Synopsis—Colorimetric analyses of alcoholic extracts of the skin were used to determine the hexachlorophene content of the skin after washing with hexachlorophene-containing soaps. The quantity of hexachlorophene applied was found to be a major factor controlling the amount deposited. Significant quantities of hexachlorophene were left on the skin after soaking in baths containing very low concentrations of the compound.

Introduction

Hexachlorophene has been widely used as the antibacterial component in degerming soaps and detergent formulations. The reduction in the number of bacteria on the skin achieved through the continued use of these products is well documented (1). It is attributed to the buildup of effective levels of the compound on the skin (2). However, determination of these levels has been the subject of very few publications (3–5). The object of this study was to follow the concentrations of hexachlorophene retained by the skin under controlled washing conditions.

Experimental

Extraction and Analytical Procedures

The forearms were selected as the test site since they were accessible, maneuverable, and less exposed to contamination than the hands. The hexachlorophene was recovered from the skin by immersing the arm,

* Givaudan Corp., 330 W. Forty-second St., New York, N. Y. 10018.

Table I
Recovery of Hexachlorophene

Vehicle	Quantity applied (mg)	Concentration found (mg)
Alcohol	0.50	0.52
Alcohol	0.50	0.53
Alcohol	0.50	0.45
Alcohol	0.50	0.46
Soap	0.50	0.56
Soap	0.50	0.57
Soap	1.00	1.04

from wrist to elbow, in a vessel containing 1000 ml of 95% ethanol while gently agitating the solution. The alcoholic extract was concentrated on the steam bath to a volume (10 to 100 ml) suitable for hexachlorophene analysis.

The 4-aminoantipyrine colorimetric procedure was selected as the most suitable method for determining the hexachlorophene in the concentrated extract. The ultraviolet absorption method, with which this laboratory has had extensive experience, was ruled out. The levels of hexachlorophene were low in many cases, and the UV absorption by skin extracts frequently swamped the absorption by the hexachlorophene.

An ammonia buffer solution (6) was used in place of sodium carbonate described in the literature (7, 8). 4-Aminoantipyrine forms a red color with hexachlorophene in the presence of a mild oxidizing agent. The color density was measured with a Beckman DK2 automatic recording spectrophotometer. The entire absorption curve was scanned so that interferences or turbidity could be observed.

Preliminary tests with known amounts of hexachlorophene applied to the skin were conducted to determine the relative validity of these procedures. The hexachlorophene was distributed over the forearms as alcoholic or 5.0% liquid soap solutions and permitted to dry. The arms were then immersed in alcohol, and the extract was condensed to 10.0 ml for analysis. Results of these tests (Table I) demonstrate that quantitative recovery and analyses of the hexachlorophene content of the skin could be made with these procedures.

Soap Bar Tests—Single Applications

The forearms were washed with soap bars ($1\frac{1}{4} \times 2\frac{1}{4}$ in.) containing hexachlorophene using the following general procedure:

Table II
Single Washing

Hexachlorophene Concentration in Soap (%)	Hexachlorophene Concentration on Skin (γ/cm^2)
0.25	0.15, 0.29, 0.31, 0.32
0.50	0.42, 0.42, 0.45, 0.47, 0.47
1.0	0.52, 0.65, 0.74, 0.81, 0.82 0.82, 0.84, 0.90, 0.92, 1.02
2.0	0.90, 0.95, 1.02, 1.05 1.09, 1.19, 1.19, 1.29 1.34, 1.35, 1.42, 1.47
5.0	1.94, 2.74, 3.39, 3.55 3.55, 3.71, 4.03, 4.35

Plastic gloves were fastened on both hands, the arms were moistened with warm water, and the test soap was applied by rubbing all areas of the forearm from wrist to elbow for fifteen seconds. The arm was then lathered for thirty seconds and rinsed with 1500 ml of warm water. Immediately after rinsing, the arm was immersed in 1000 ml of alcohol and the extract condensed and analyzed as previously described. Most of the tests in this investigation were conducted on the forearms of the same two subjects. Occasionally, additional subjects were included for a single test and in every instance produced comparable data to the standard subjects.

Results of single washings with bars containing various concentrations of hexachlorophene are listed in Table II. Each figure represents the quantity recovered from an arm after one washing with the specified soap bar. The data are recorded as micrograms hexachlorophene per square centimeter of skin, using 620 sq cm as the approximate area of forearm skin. A minimum period of forty-eight hours was permitted to elapse after each test before an arm was re-used. These results show that the higher the hexachlorophene content of the bar the greater the deposition on the skin. Despite some spread in the results for a given soap and the slight overlapping between the 1 and 2% bars, each of the test soaps can be differentiated from another by the quantity of hexachlorophene deposited.

The amount of hexachlorophene retained by the skin from the various soaps was directly compared in a series of repetitive tests. Different arms were washed at the same time with bars containing 1, 2, and 5% hexachlorophene, and the quantity left on the skin was determined.

Table III

Single Washing—Replicate Tests

Hexachlorophene Concentration in Soap (%)	Hexachlorophene Concentration on Skin (γ/cm^2)				
	Test 1	Test 2	Test 3	Test 4	Test 5
1.0	1.00	1.15	0.81	0.63	0.77
2.0	1.55, 1.42[a]	1.65, 1.47[a]	1.40	1.08	1.50
5.0	2.90	3.03	2.60	2.32	2.58
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[a] Two arms tested with 2.0% hexachlorophene soap.

Table IV

Multiple Washing—4 Day Period

Hexachlorophene Concentration in Soap (%)	Hexachlorophene Concentration on Skin (γ/cm^2)
1.0	1.7 (0.82)[a]
2.0	3.5 (1.19)
5.0	9.4 (3.55)
10.0	15.5

[a] Numbers in parentheses are medians of results obtained from one washing (Table II).

This test was repeated four times on four different days. At least forty-eight hours lapsed between tests. Results in Table III show that within each test run there is an increase in hexachlorophene deposition as its content in the soap increased. However, this relationship is not necessarily present if isolated data from one test are compared to another; for example, the 1% bar in Test 2 deposited more than the 2% bar in Test 4. This discrepancy apparently stems from the fact that all of the test soaps deposited their lowest quantities in Test 4 and their highest in Test 2. This is illustrated in Fig. 1. Therefore, the comparative effects of different soaps is best determined by tests conducted at the same time.

Multiple Washings—Four-Day Periods

Tests were conducted in which the arms were washed with soap bars six times over a four-day period and the hexachlorophene retained by the skin determined after the sixth application. These results, listed in Table IV, show a significant increase in the quantity deposited by all bars compared to a single application (see Tables II and III).

Multiple Washings—One-Day Period

Previous investigations (4) had demonstrated that the quantity of hexachlorophene retained by the skin reached a "plateau" level after a number of daily washings and remained relatively constant thereafter. An attempt was made to attain a plateau level in a single day by washing the arms with a soap and rinsing every twenty minutes. The tests were conducted with both 1.0 and 2.0% hexachlorophene-containing

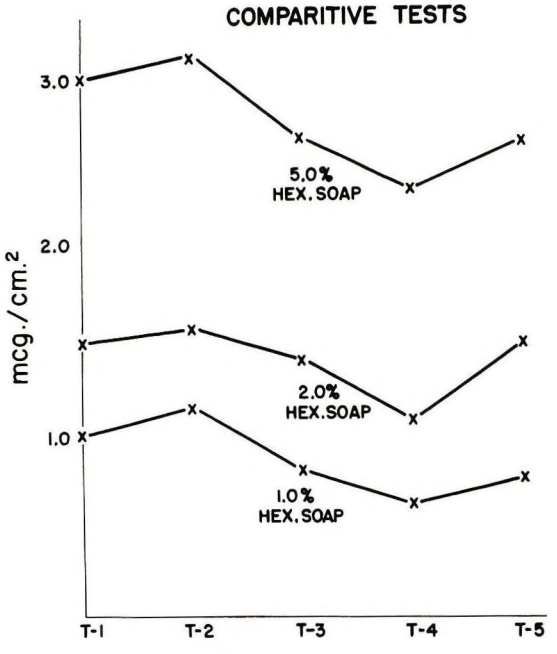

Figure 1. Deposition of hexachlorophene on skin from soaps

soaps. Different arms were immersed in alcohol, the hexachlorophene was extracted after the ninth, twelfth, sixteenth, and twentieth washings, and the quantity deposited was determined. The data in Table V show an irregular but continual rise in the hexachlorophene buildup on the skin as the number of washes increased. No plateau effect could be demonstrated in these tests. The quantity of hexachlorophene retained from the 2.0% bar was approximately one and one-half to two times the amount retained from the 1.0% soap through the twenty applications.

Table V

Multiple Washing—1 Day Period

Number of Washings	Concentration on Skin (γ/cm^2) 2.0% Hex. Soap	1.0% Hex. Soap
9	3.2	1.8
12	3.9	1.9
16	4.0	2.3
20	4.7	2.6

Table VI

Single Washing—Extended Time Periods

Length of Time of Soap Application (minutes)	Concentration of Hexachlorophene on Skin (γ/cm^2)
0.25	1.3
2.0	2.3
4.0	3.6
8.0	5.2

Single Application—Extended Washing Time

The accumulation of hexachlorophene on the skin was measured using a single washing with varying time periods for the application of the soap. The arms were washed with a 2.0% hexachlorophene soap for periods up to eight minutes, rewetting the soap every two minutes. The arms were then lathered and rinsed, and the hexachlorophene was extracted in the usual manner. Analysis of these extracts, listed in Table VI, clearly indicated a marked increase in the amount of hexachlorophene left on the skin with increased time of application of the soap.

Bath vs. Shower Tests

Skin retention tests were conducted comparing a shower to a bath rinsing procedure. Exactly 1.0 g of a 2.0% hexachlorophene soap bar was applied to each of the forearms with frequent intermittent rinsing until the entire soap sample had been consumed. Rinsing by shower was accomplished by spraying warm water from a shower head over the arm. The bath rinse consisted of immersion of the arm in a pan containing 3000 ml of water with a final four-minute soaking in this

water. Analysis of the alcohol extractions of the arms prodcued the following results:

	Concentration of Hexachlorophene on Arms	
Procedure	Total (mg)	γ/cm^2
Shower	1.34–1.66	2.2–2.7
Bath	1.48–1.56	2.4–2.5

These data show that approximately equivalent amounts of hexachlorophene are retained by the skin from both procedures. It is interesting to observe that the skin retained about 7.5% of the total hexachlorophene applied (20.0 mg in 1.0 g of 2.0% hexachlorophene soap).

Bath Tests

During these studies it was found that significant quantities of hexachlorophene would be retained by the skin after immersion in a bath containing low concentrations of the compound. Aliquots of a 10.0% hexachlorophene solution in 50% ethanol were added to a bath containing 5000 ml of warm water. The forearm was moistened in the bath, washed with a nonmedicated soap, then reimmersed in the bath for a period of five to ten minutes. Immediately after bathing the arms were immsered in alcohol; the extract was condensed and analyzed for hexachlorophene. The results are listed in Table VII with each of the figures representing an individual test conducted on a single arm in a bath with the specified hexachlorophene content. The data clearly demonstrate that substantial quantities of hexachlorophene are deposited on the skin from baths containing relatively low concentrations of the compound. Bathing in water containing 4.0 mg/l of hexachlorophene deposits approximately the same amount of compound on the skin

Table VII
Bath Tests

Hexachlorophene Concentration in Bath (mg/l)	Hexachlorophene Concentration on Skin (γ/cm^2)
4.0	0.87, 0.87, 1.08, 1.26 1.35, 1.61, 1.77, 1.77, 2.10
20.0	3.39, 4.19, 4.35, 5.00 5.65, 5.81
40.0	9.35, 9.35, 10.00

Table VIII
Bath Oil Tests

Product	Hexachlorophene Concentration in Bath (mg/l)	Hexachlorophene Concentration on Arm (γ/cm^2)
Bath Oil "A" (3.0% Hex.)	6.0	4.2–8.2
Bath Oil "B" (4.0% Hex.)	12.0	10.6–17.4
Bath Oil "C" (1.0% Hex.)	3.0	2.7–4.2
Bath Oil "D" (3.0% Hex.)	10.0	5.2–6.8

as a single washing with a 2.0% hexachlorophene soap. Raising the hexachlorophene content of the bath results in an increased deposition on the skin. Several of these tests were repeated without washing with the nonmedicated soap, and analogous results were obtained.

Bath Oils

Skin retention tests were conducted in baths containing various bath oils formulated with hexachlorophene. Results of these tests, listed in Table VIII, demonstrate the relatively large quantities of hexachlorophene that can be put on the skin by use of these products. The wide spread in results for a given product can be attributed to nonuniform distribution of the floating oils through the bath.

Discussion and Summary

Previous studies of hexachlorophene on the skin have employed bioassay (3), radioactive techniques (4), and ultraviolet analysis of alcohol extracts (5). Shemano and Nickerson (4) found that hexachlorophene accumulated on the skin during the first three or four washes and remained relatively constant thereafter. Compeau (5) showed that hexachlorophene builtup during the first five to ten minutes of scrubbing but then accumulated no further after additional washing. He suggested that hexachlorophene was adsorbed on the skin through an ionic reaction with the cationic proteins of the skin. Recently, Parran (9) suggested the analogy between retention of antimicrobials on the skin and the problem of soil redeposition during the laundering of clothes.

This study determined the hexachlorophene content of skin by a colorimetric analysis of concentrated alcohol extracts of the skin. It was found that the quantity of hexachlorophene applied to the skin was a major factor in controlling the amount retained. Increasing quantities were deposited by the following methods:

(a) Raising the concentration of hexachlorophene in the soap
(b) Increasing the number of washes
(c) Increasing the amount of soap applied during a single wash

There was no evidence indicating selective adsorption of hexachlorophene onto the skin, and no plateau levels were attained in any of these tests. In many instances the quantity retained varied roughly in direct proportion to the concentration in the soap or bath. Bath tests indicated no exhaustion of hexachlorophene from the bath, and it appeared that deposition depended on the wet pickup of the skin. Therefore, it is suggested that the deposition of hexachlorophene is due to its physical entrapment on the skin. It is probably retained both as individual particles and solubilized in the soap left on the skin after washing.

The relationship between the quantity of hexachlorophene and the number of microorganisms present on the skin has often been implied but never directly studied. Information on this subject could be obtained in washing tests using the hands for bacterial counts and alcohol extractions of the arms for chemical analysis. It has been assumed during hand washing studies that the hexachlorophene content on a subject's hand is built up to effective antimicrobial levels after several days of washing with the hexachlorophene-containing soap. However, the quantity deposited is dependent on the quantity applied, which in turn will vary with the individual washing habits of the test subjects. Therefore, closer control of the mechanics of the washing process in tests with antimicrobial soaps would be in order. These studies would be accelerated by depositing large concentrations of the compound on the skin immediately through the use of a five to ten minute initial wash with continual reapplication of the test soap.

(Received November 30, 1966)

References

(1) Sindar Corp., G-11 (Hexachlorophene USP) an annotated bibliography, *Tech. Bull. H-1* (1965).
(2) Cade, A. R., and Gump, W. S., in Reddish, G. F., *Antiseptics, Disinfectants, Fungicides, and Chemical and Physical Sterilization*, Lea & Febiger, Philadelphia, Pa., 1957, pp. 319–354.
(3) Fahlberg, W. J., Swan, J. C., and Seastone, C. V., Studies on the retention of hexachlorophene (G-11) in human skin, *J. Bact.*, **56**, 323–328 (1948).
(4) Shemano, I., and Nickerson, M., Cutaneous accumulation and retention of hexachlorophene —C^{14} (G-11), *Federation Proc.*, **13**, Part 1, 405 (1954).
(5) Compeau, G. M., The adsorption of dodecylbenzenesulfonate and hexachlorophene on the skin, *J. Pharm. Sci.*, **49**, 574–580 (1960).

(6) Johnson, C. A., and Savidge, R. A., The determination of phenolic compounds in pharmaceutical preparations using 4-aminophenazone, *J. Pharm. & Pharmacol.*, **10,** 171 T–181 T (1958).
(7) Gottlieb, S., and Marsh, P. B., Quantitative determination of phenolic fungicides, *Anal. Chem.*, **18,** 16–19 (1946).
(8) Sindar Corp., Methods of analysis for the quantitative determination of G-11, *Tech. Bull. H-7.*
(9) Parran, J. J., Deposition on the skin of particles of antimicrobial agents from detergent bases, *J. Invest. Dermatol.*, **45,** 86–88 (1965).

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Keratin Replacement as an Aging Parameter

NORMAN ORENTREICH, M.D.* and NANCY J. SHARP, B.A.†

Presented September 20, 1966, Seminar, New York City

Synopsis—The rate of nail growth diminishes in a measurable, reproducible, predictable manner with increasing age. There is a diminution in this rate of almost 40% between the ages of 25 and 95, or about 4.5 μ/week for each year of age after maturation. Young men's nails grow faster than women's until middle age but grow more slowly after the seventh decade of life. The known factors that have no effect on or that alter nail growth are enumerated. The measurement of nail growth may be a useful method of screening cosmetic preparations that may influence the nail.

Introduction

The scarcity of techniques for measuring and evaluating physiologic age, both in humans and animals, has hampered the advance of the science of experimental gerontology. A useful aging parameter must fulfill the following criteria: ease of performance, valid predictability in relationship to aging and longevity, reproducibility, low variability in each age range, and known relationship to disease.

Studies performed on the rate of keratin replacement of hair, nails, and skin indicate that there is a definite relationship between this rate and the age of the individual. The earliest known quantitative evaluation of the rate of regeneration of epithelium was performed during World War I in France by Carrel and duNouy (1). While involved in the development of a better antiseptic for wounds, they developed

* Orentreich Medical Group, 909 Fifth Ave., New York, N. Y. 10021.
† Orentreich Foundation for the Advancement of Science, New York, N. Y. 10021

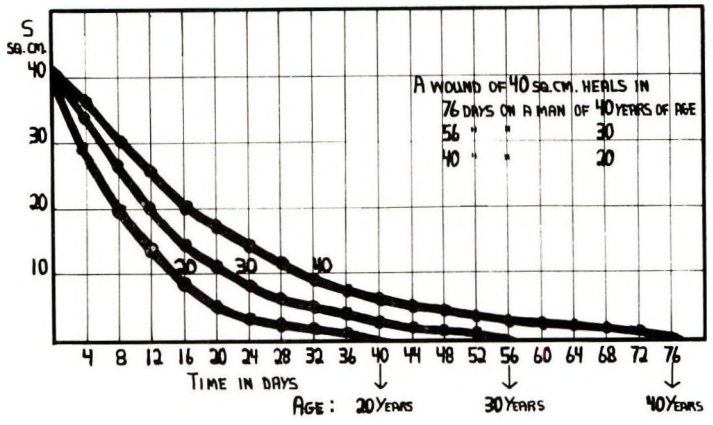

Figure 1. Index of epithelialization as a function of age

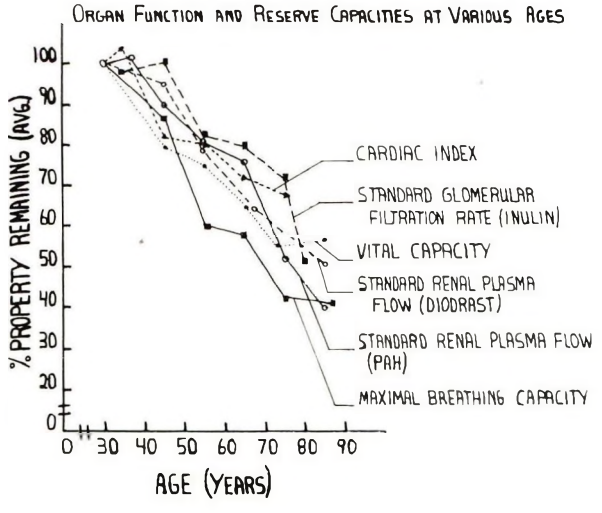

Figure 2. Per cent physical capacities remaining at various ages

a planimetric method for measuring the rate of epithelialization of a wound. For the first time, the generally accepted phenomenon that wounds heal more slowly in an aged person than in a younger one was measured in a quantitative fashion. The curve of the rate of epithelialization in wound-healing as a function of the age of the subject is presented in Fig. 1. By measuring the area of a wound under normal conditions, i.e., eliminating infected wounds, pathologic conditions, wounds which measured under 5 cm^2, etc., duNouy was able to calculate the "index of cicatrization" (which was actually the rate of epitheli-

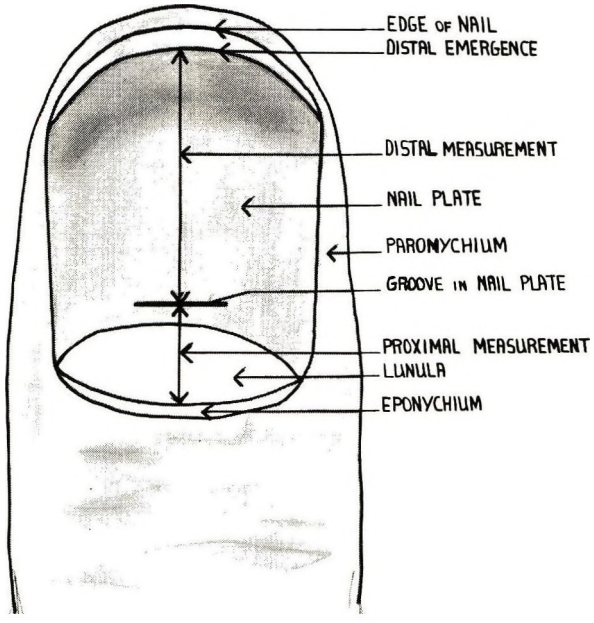

Figure 3. Method for nail growth measurement

alization as duNouy measured it) of a wound, with size of the wound and age of the individual as the only variables. The subjects were soldiers, healthy men between the ages of 20 and 40. This index of cicatrization formula enabled duNouy to calculate the time a wound would take to epithelialize, given only its dimensions and the age of the patient.

Shock (2) measured the decline in various physiologic functions with age in a large population segment. The graph in Fig. 2 represents a cross-sectional average of the per cent decline in performance of six functions which Shock measured in subjects of all ages. Although some functions, such as conduction velocity, decline only about 15% from age 30 to age 90 others (such as maximal breathing capacity) were found to retain only about 40% of their original capacity in 90-year-old individuals. Averaging all nine parameters, it appears that the decline in function of an individual is about 40% between the ages of 30 and 90, or that a 90-year-old retains, on the whole, about 60% of the reserve capacity of his youth.

Studies have been performed on the technique of measuring mitosis in the human epidermis, and the relation of keratin replacement to age (3–7). Barman (8, 9) and Rook (10) have studied changes in human

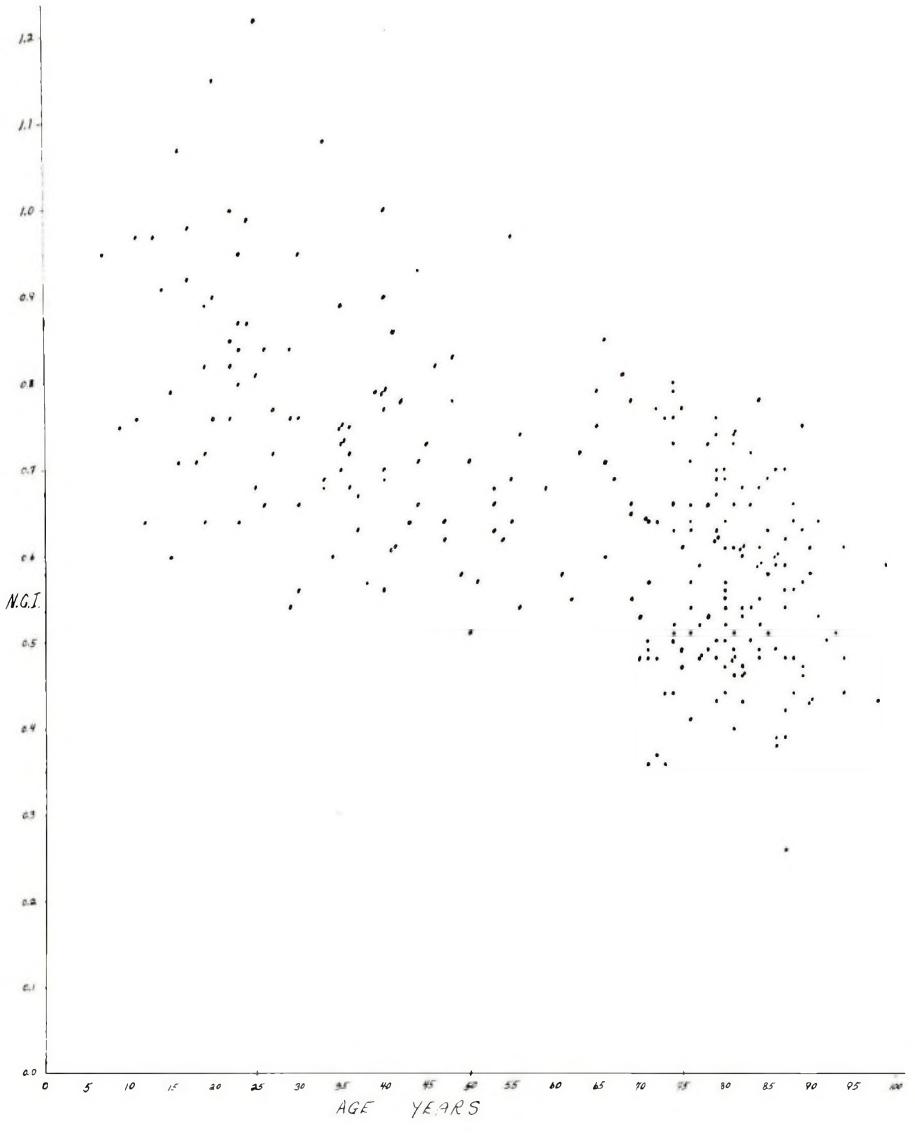

Figure 4. Scattergram of Nail Growth Index as a function of age

hair with age. Their experiments have shown that definite changes with age include a decrease in the density of hairs, a decrease in the percentage of coarse hairs with an increase in the percentage of fine hairs, and a decrease in the percentage of anagen (growing) hairs as compared to an increase in telogen (resting) hairs.

Table I
Age Distribution by Decade (257 Subjects)

Age (yr.)	Females	Males
10–19	8	8
20–29	16	8
30–39	10	11
40–49	17	6
50–59	12	1
60–69	12	2
70–79	45	12
80–89	55	21
90–99	10	3
Total	185	72

This paper concerns itself with changes in the rate of fingernail growth with age. The work is part of a research program to develop useful parameters of aging and to understand the significance of keratin replacement as a measure of physiologic function and reverse capacity.

Method

With the edge of a glass slide, a scratch was made transversely in the nail plate near the top of the lunula (Fig. 3). For this study only the thumbnails were measured. A calibrated micrometer built into a magnifying lens was used to measure the distance proximally from the scratch to the edge of the eponychium (cuticle) and distally from the scratch to the distal emergence (where the nail plate leaves the nail bed). Thus two values were obtained, distal and proximal, as a cross-check to prevent errors. Measurements were made at intervals, permitting the calculation of average growth in millimeters over a period of time as the transverse groove on the nail grew out. Measurements were generally taken at four- and at eight-week intervals; the total growth in millimeters was then divided by the time elapsed in weeks to yield the Nail Growth Index, or NGI, in millimeter growth per week.

Subjects were 257 normal males and females, selected among staff members and their families, patients with normal nails in a dermatologic practice, and residents of the Menorah Home for the Aged in Brooklyn. The ages of the 185 females and 72 males were distributed, by decade, as shown in Table I. Several studies were performed over a one-year period in order to determine seasonal changes in growth.

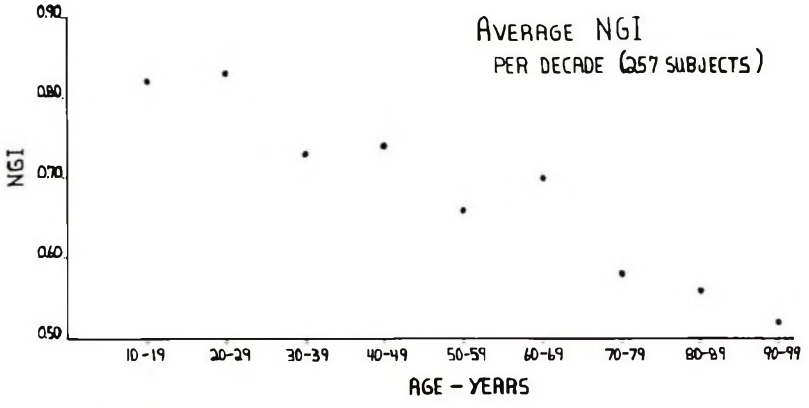

Figure 5. Average Nail Growth Index per decade of 257 subjects

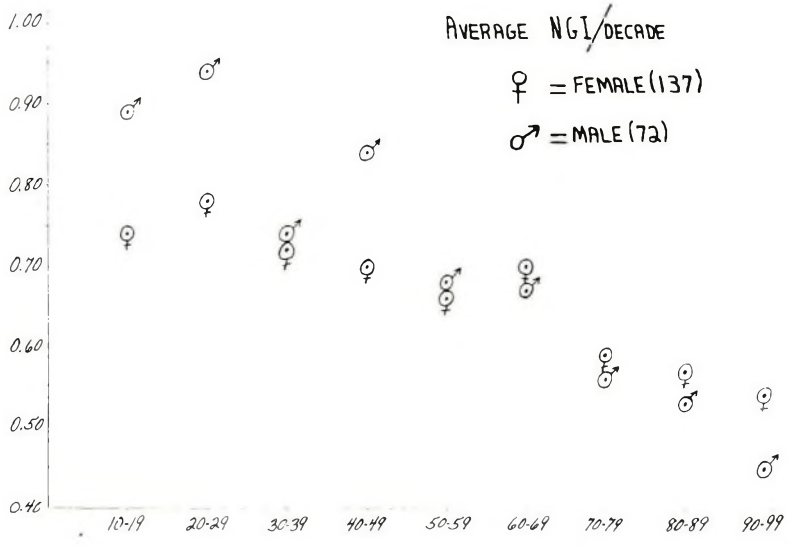

Figure 6. Average Nail Growth Index per decade, male *vs.* female

Results and Conclusions

The scattergram in Fig. 4 shows the average Nail Growth Index of 257 individuals in the study. Since right and left nails were found to grow at a similar rate in most individuals, the average of the two nails was used in computing the data. Broken down into decades, these figures were averaged, as plotted in Fig. 5. NGI's decreased from a

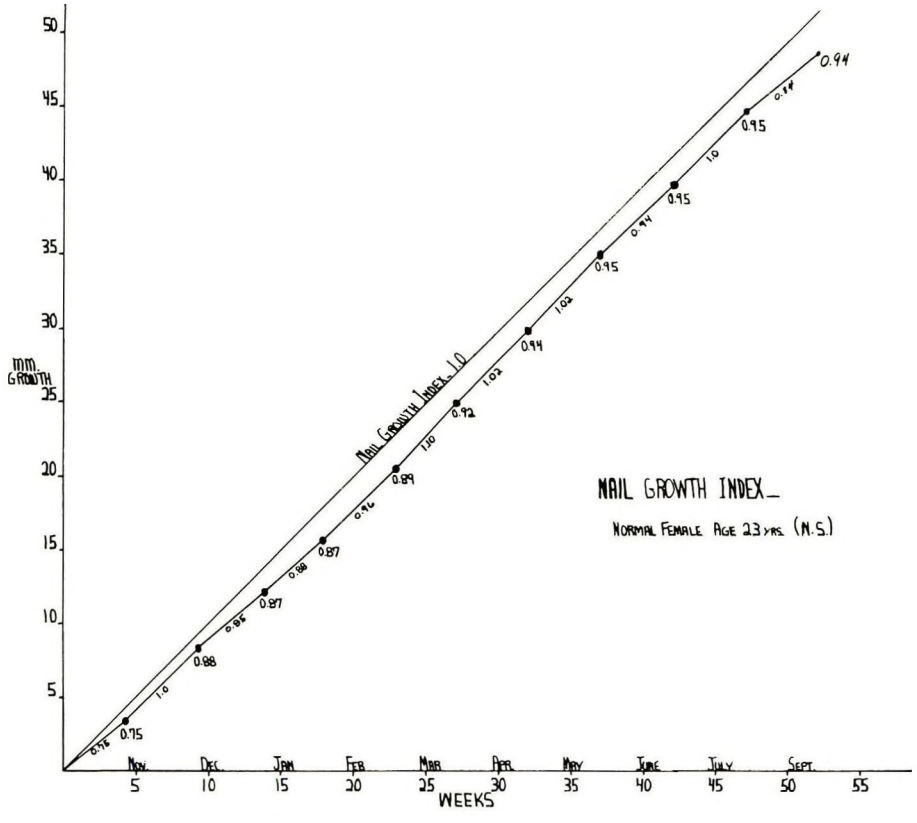

Figure 7. One year nail growth curve of twenty-three-year-old female

high value of 0.83 (average) for the third decade of life to 0.52 (average) in individuals between 90 and 99 years of age. This is a decrease of about 38% in rate of growth over a period of 70 years.

These averages per decade were also broken down by sex, as shown in Fig. 6. Males had a higher NGI until about the sixth decade, when the values for males and females are very close. By the eighth decade, growth rate of males begins to fall below that of females; in the tenth decade average NGI for males is 0.45, while that of females is 0.54.

One year studies of individuals indicated a linear rate of nail growth with little seasonal variation. Figure 7 shows the growth of a 23-year-old female over a one year period, measures every four to six weeks, plotted against the 45° slope of a Nail Growth Index of 1.0 mm/week. Average growth of this subject was 0.95 mm/week.

Table II
Nail Growth Factors

Faster	Slower	No Effect
Males	Females	Left- or right-handedness
Pregnancy	Lactation	Season
Third digit	First digit	Minor chronic illness
Piano playing	Aging	Occupation
Onychophagia	Severe cold	Dietary habits
	Acute infection	Moderate emotional stress
	Pneumonia	Minor surgery
	Mumps	Height and weight
	Malnutrition	Weight change
	Decreased circulation	Color
	Smoking	Nail polish and remover
	Congestive heart failure	
	Paralysis	
	Sleep	

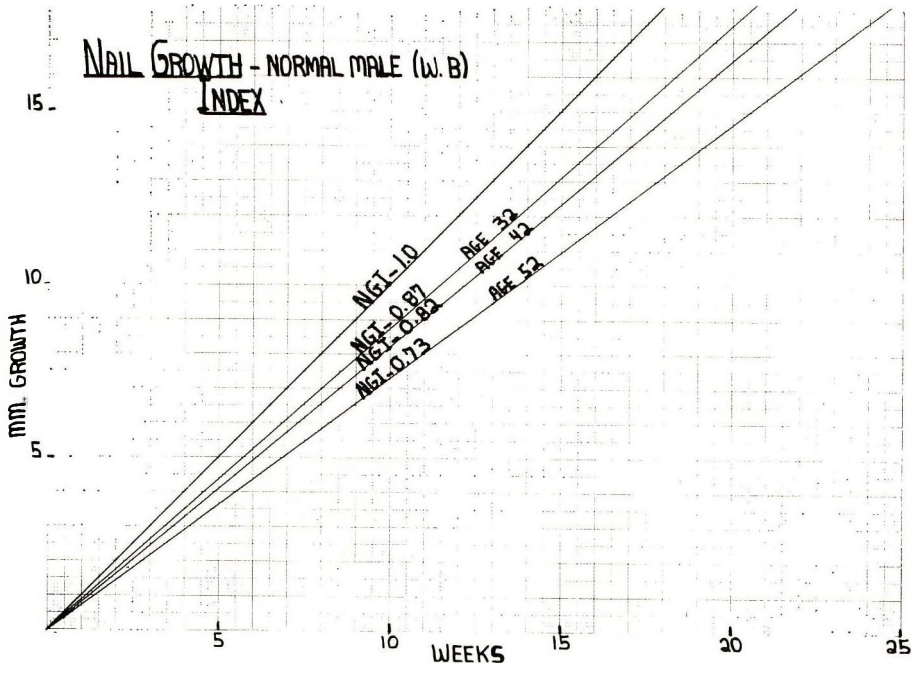

Figure 8. Nail Growth Index slope at ten-year intervals

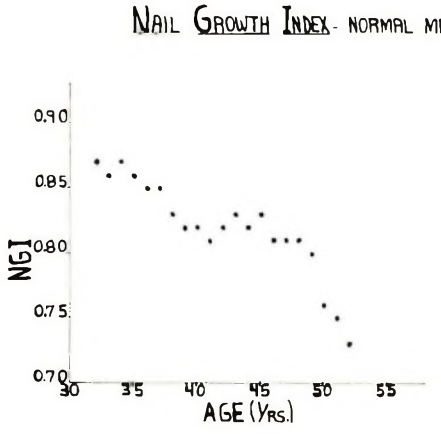

Figure 9. Yearly Nail Growth Index for twenty years

Discussion

A significant decline with age in the rate of nail growth was found in this study. Young males show faster growth rate than females; this difference diminishes toward middle age and reverses itself after the seventh decade of life. This may be correlated with the "male menopause." The rate of growth is not noticeably affected by mild climatic changes, although severe changes in temperature have been shown to alter this rate markedly (11). Table II is a summary of various factors which are reported to alter nail growth rate (11–17). The table also lists those factors that have already been shown to have no effect. This technique of measuring the rate of nail growth can be used to monitor the potential effects of nail cosmetics and of products alleged to influence nail growth.

The results of this study are in agreement with those of several previous experiments on the rate of linear nail growth. Bean (12, 13) performed a 20-year study of his own thumbnails, measuring the number of days which a scratch at the proximal edge of the nail plate took to grow out to the distal end. Converting his data into millimeter growth per week, his NGI decreased from 0.87 at age 32 to 0.82 at age 42 and to 0.73 at age 52 (Fig. 8). Figure 9 represents Bean's Nail Growth Index as measured each year from age 32 to age 52.

Cross-sectional studies of linear nail growth have been performed by Hillman (17), who measured 300 individuals, and by Hamilton (16), who studied over a thousand subjects. Their average measurements,

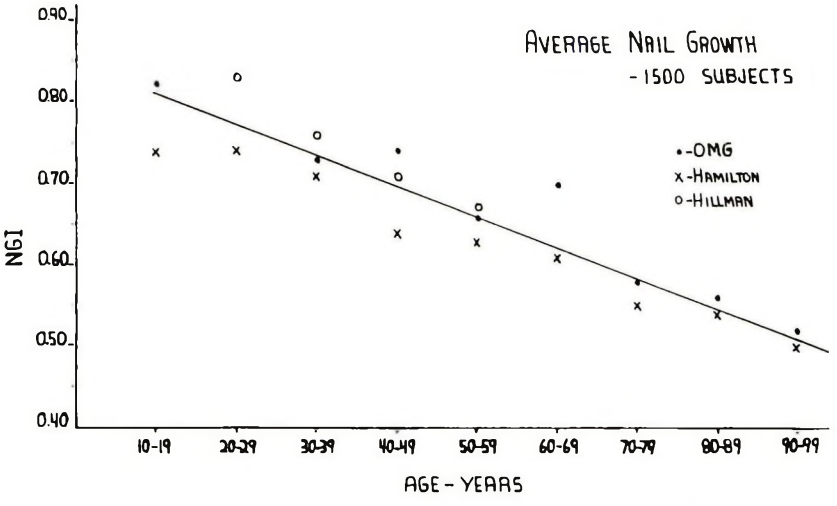

Figure 10. Average decline in nail growth with age, 1500 subjects

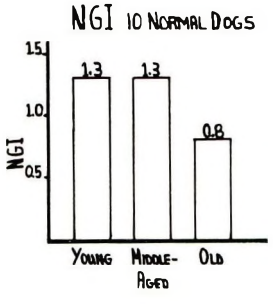

Figure 11. Nail growth in ten dogs

by decade, were converted into milliliter growth per week and, superimposed onto the slope of the graph from this study, revealed similar values at all ages to those reported in this paper. The average slope of these figures from all three experiment, as shown in Fig. 10, represents over 1500 subjects whose nail growth rates decrease on the average of 4.5 μ/week for every year of age, from age 20 to age 100. These figures represent a 40% diminution over a 70-year period and concur with the average changes which Shock found in his aging parameters.

The decrease in rate of nail growth with aging was linear for the cross-sectional studies. However, the individual longitudinal study performed for 20 years by Bean showed that the rate of growth declined at varying rates. Many more such studies over longer periods of time

are needed to determine if the average individual growth declines in a linear, stepwise, or other fashion.

Preliminary studies performed on dogs (Fig. 11) show that young and middle aged dogs' claws grow about 1.3 mm a week, whereas old dogs average 0.8 mm a week (18). Techniques described by Godwin (15) for measuring nail growth in the rat may permit controlled aging studies on this animal.

Further experiments on factors which affect nail growth, the relationship of linear growth to nail volume, and the linearity of longitudinal measurements over extended periods of time will reveal more information as to the true meaning of this measurement. To date, the use of linear nail growth measurements as a parameter of physiologic age appears both valid and significant.

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References

(1) du Nouy, P. leComte, *Biological Time*, The Macmillan Co., New York, 1937, pp. 51–101.
(2) Strehler, B. S., *Time, Cells, and Aging*, Academic Press, New York, 1962, p. 96.
(3) Epstein, W. L., and Maibach, H. I., Cell renewal in human epidermis, *Arch. Dermatol.*, **92,** 462 (1965).
(4) Katzberg, A. A., Influence of age on rate of desquamation of the human epidermis, *Anat. Record*, **112,** 418 (1952).
(5) Thuringer, J. M., and Katzberg, A. A., The effect of age on mitosis in the human epidermis, *J. Invest. Dermatol.*, **33,** 35 (1959).
(6) Van Scott, E. J., Ekel, J. M., and Auerbach, R., Determinants of rate and kinetics of cell division in scalp hair, *Ibid.*, **41,** 269 (1963).
(7) Weinstein, G. D., and Van Scott, E. J., Autoradiographic analysis of turnover times of normal and psoriatic epidermis, *Ibid.*, **45,** 257 (1965).
(8) Barman, J. M., Pecoraro, V., and Astore, I., Method, technic and computations in the study of the trophic state of the human scalp hair, *Ibid.*, **42,** 421 (1964).
(9) Barman, J. M., Astore, I., and Pecoraro, V., The normal trichogram of the adult, *Ibid.*, **44,** 233 (1965).
(10) Rook, A., Normal and abnormal hair growth in old age, *Gerontol. Clin.*, **7,** 8 (1965).
(11) Babcock, M. J., Methods for measuring fingernail growth rates in nutritional studies, *J. Nutrition*, **55,** 323 (1955).
(12) Bean, W. B., Nail growth, *Arch. Internal Med.*, **11,** 476 (1963).
(13) Bean, W. B., A discourse on nail growth and unusual fingernails, *Am. Clin. and Climat. Assoc.*, **74,** 152 (1963).
(14) Geoghegan, B., Roberts, D. F., and Sampford, M. R., A possible climatic effect on nail growth, *Appl. Physiol.*, **13,** 135 (1958).
(15) Godwin, K. O., Experimental study of nail growth, *J. Nutrition*, **69,** 121 (1959).
(16) Hamilton, J. B., Terada, H., and Mestler, G. E., Studies of growth throughout the life-span in japanese: growth and size of nails and their relationship to age, sex, heredity, and other factors, *J. Gerontol.*, **10,** 401 (1955).
(17) Hillman, R. W., Fingernail growth in the human subject, *Human Biol.*, **27,** 274 (1955).
(18) Orentreich, N., and Ettinger, S., Unpublished data.

Society of Cosmetic Chemists
1967 Meetings

The Society of Cosmetic Chemists will hold the following meetings in 1967:

Date	*Meeting*	*Location*
Sept. 21, 1967 Sept. 22, 1967	Seminar	Ambassador Hotel Chicago, Illinois
Dec. 6, 1967	Semi-annual	Americana Hotel New York, New York

J. Soc. Cosmetic Chemists, 18, 549–562 (Aug. 19, 1967)

Effect of Topical Hormones on Aging Human Skin*

CHRISTOPHER M. PAPA, M.D.†

Presented September 20–21, 1966, Seminar, New York City

Synopsis—The male hormone, testosterone, has a rejuvenating or ameliorative effect when applied to aging human skin. Clinically evident changes, such as effacement of wrinkles, hair growth, and augmented sweating, are present but modest, particularly when compared to the improvement in the microscopic architecture of the skin. Progesterone and pregnenolone produce similar but more diminutive alterations. The female hormone, ethinyl estradiol, was without effect, while the corticosteroids accentuated the degradative changes of senescence.

The aged comprise an ever-increasing proportion of the population. The chronic internal disorders of old age are under intensive study because they threaten life and lessen the enjoyment of living. The age-dependent changes of the vital organs have been reasonably well appraised, but the skin is a special case. No one dies of aged skin; appearance spoils life only indirectly as suggested by the statement that people feel as young as they look. The desolate appearance of truly senescent skin can impair mental and physical well-being. The importance of looking and feeling attractive may be easily submerged in the concern over the other traditional scourges. In light of recent medical advances against serious ailments, the time may be ripe to turn attention to the relatively minor skin problems. Indeed, if the medical utopia of the future could supply us with spanking new inner organs, what a dismal package it would still be, wrapped in old skin!

* Supported in part by U. S. Public Health Service Grant.

† Department of Dermatology, University of Pennsylvania School of Medicine, Philadelphia, Pa. 19104.

Research activities, carried out in these laboratories have centered about the biology of aging skin. Dissatisfied with merely cataloging the alterations of senescence, a decision was made to try to do something about them. A strictly empirical mode of attack was based on the clinical impression of waning endocrine function with advancing age and utilized pharmacologic doses of topically applied hormones. Representative steroids from the male, female, and adrenocortical hormones were included in the study. The following report is a brief, composite picture of published work, as well as some still in progress (1, 2).

Methods

Approximately 200 residents of the Riverview Home for the Aged have participated in the research program over the past five years. Almost all subjects manifested obvious cutaneous deterioration; the median age of the group is 65 years (range 57–88 years). Although equal numbers of men and women were included in each particular project, the sex of the aged subject is irrelevant with regard to the effect of the hormones on the skin. Biopsy samples obtained since the onset of the work amount to more than 1500 individual specimens.

It is important to emphasize that only areas of skin with clear-cut aging alterations were used. The face, extensor forearm, and back of the hand, sun exposed sites which graphically illustrate the changes of senescence, were included. The axilla was studied since it also demonstrates recognizable aging, yet it is protected from solar radiation and so suffers less deterioration.

The following hormones, compounded either into hydrophilic ointment base or alcoholic solutions, were used: testosterone propionate 1.0%, progesterone 1.0%, pregnenolone acetate* 0.5%, ethinyl estradiol 0.5%, triamcinolone acetonide† 0.5%, and fluocinolone acetonide 0.2%‡. Each unilateral test site received daily topical treatment with approximately 0.5 g of preparation while the contralateral side had the corresponding vehicle similarly applied.

Gross Properties of Aged Skin

The weather beaten, unsheltered face and hands are familiar landmarks on our aged population. Laced with fine and coarse furrows, such skin possesses a general laxness, sagging, and loss of resiliency.

* Supplied by Revlon, Inc., as Eterna 27 Cream.

† Supplied by E. R. Squibb & Sons as Kenalog Cream.

‡ Supplied by Syntex Laboratories, Inc., as Synalar Cream.

Coloring is uneven, with hyperpigmented macules appearing on the susceptible individual in ever-increasing numbers with age. Coarse hairs grow from the rim of the nose and ears of men, while women often acquire stubble on the chin and mustache areas. The sebaceous glands may attain unusual prominence and are easily visible along with sprays of superficial vessels beneath the thinned integument. Fairly large, irregular black and blue splotches are present on the extensor forearm caused by spillage of blood into innocently traumatized skin which barely cushions its vasculature. Characteristic sequelae of these events are seen as roughly linear, small ivory scars.

The aged axilla fares somewhat better with the passage of time. There is, however, considerable loss of hair, and that which remains tends to be thin, wispy, and depigmented. The underarms are drier than those of the young adult, an observation which correlates well with qualitative studies of eccrine sweating which is considerably diminished. In short, aging skin appears to be a degraded structure which bears little resemblance to its neonatal predecessor. It hardly seemed likely that further alterations were possible.

Gross Results of Steroid Application

Approximately six months of treatment are necessary before the hormonal effects become apparent. Ameliorative alterations resulted primarily from androgen application but were clearly defined in only 20% of the subjects with regard to changes in the sun-damaged skin.

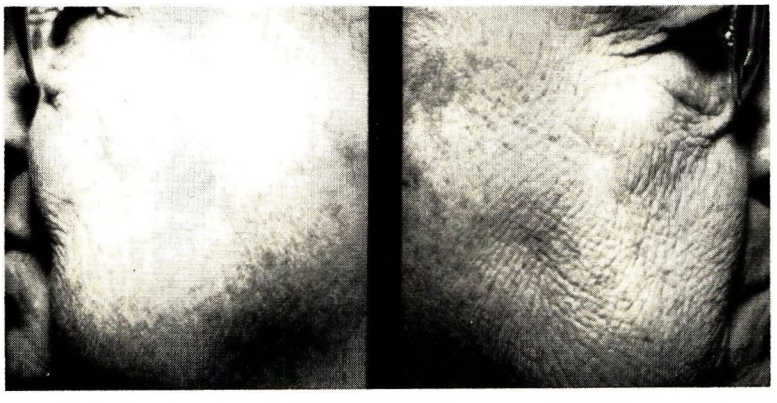
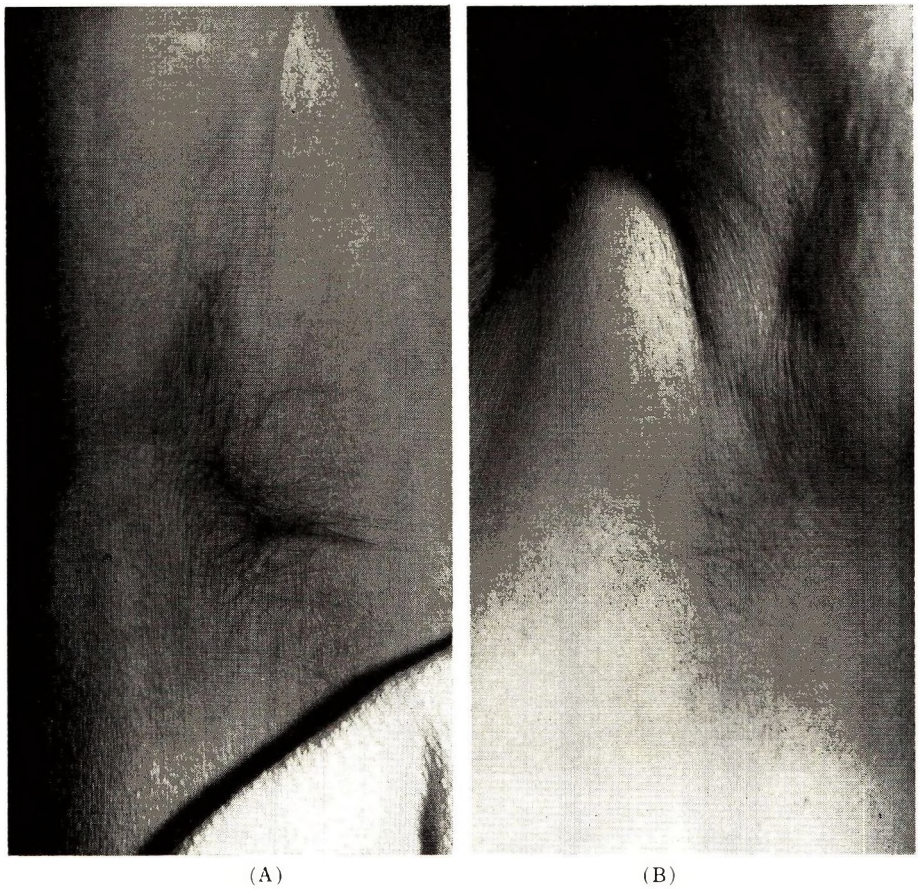


Figure 1. Cosmetic effect of topical progesterone therapy on the face of a 75-year-old woman. The left side has been treated with the hormone and the right side with the cream vehicle for three years. There is considerable effacement of the wrinkles on the progesterone-treated side and some stimulation of downy hair growth



(A) (B)

Figure 2. Comparison of hair growth in testosterone treated (A) versus control axilla (B) of 77-year-old woman. The untreated site typifies the great regression of axillary hair in old age. Note that the testosterone effect is strictly limited to the hormone treated side, where there is remarkable regrowth of hair

Fully three quarters of the individuals, however, showed unmistakable axillary responses. The wrinkled appearance of the face and dorsum of the hand was considerably smoothed, and the skin felt firmer and thicker (Fig. 1). The lax integument of the back of the hand which formerly tented for a finite time when pulled up and stretched now sprang back quickly. A remarkable stimulation of terminal hair growth was found in the axilla (Fig. 2) and to a lesser extent on the forearms and face (Fig. 3). Similar augmentation was produced on the abdomen, back, and thigh. Eccrine function of the axilla, assessed using Wada's iodine-starch-castor oil procedure, was also enhanced. This effect is due

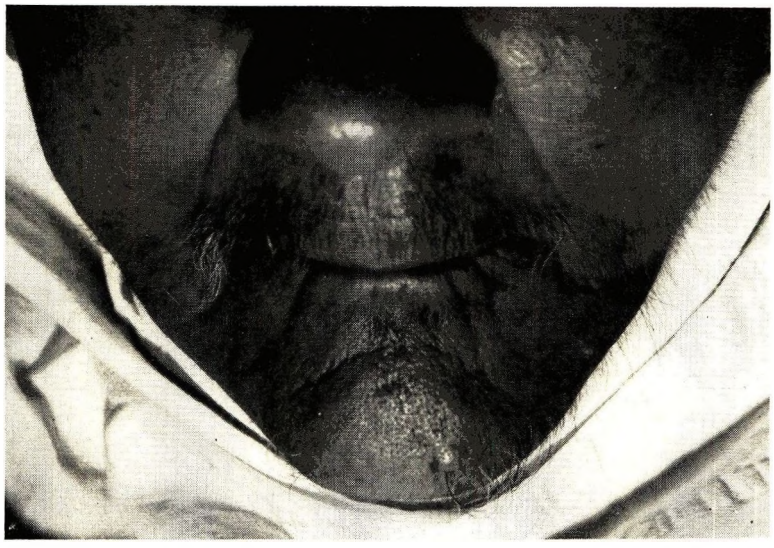


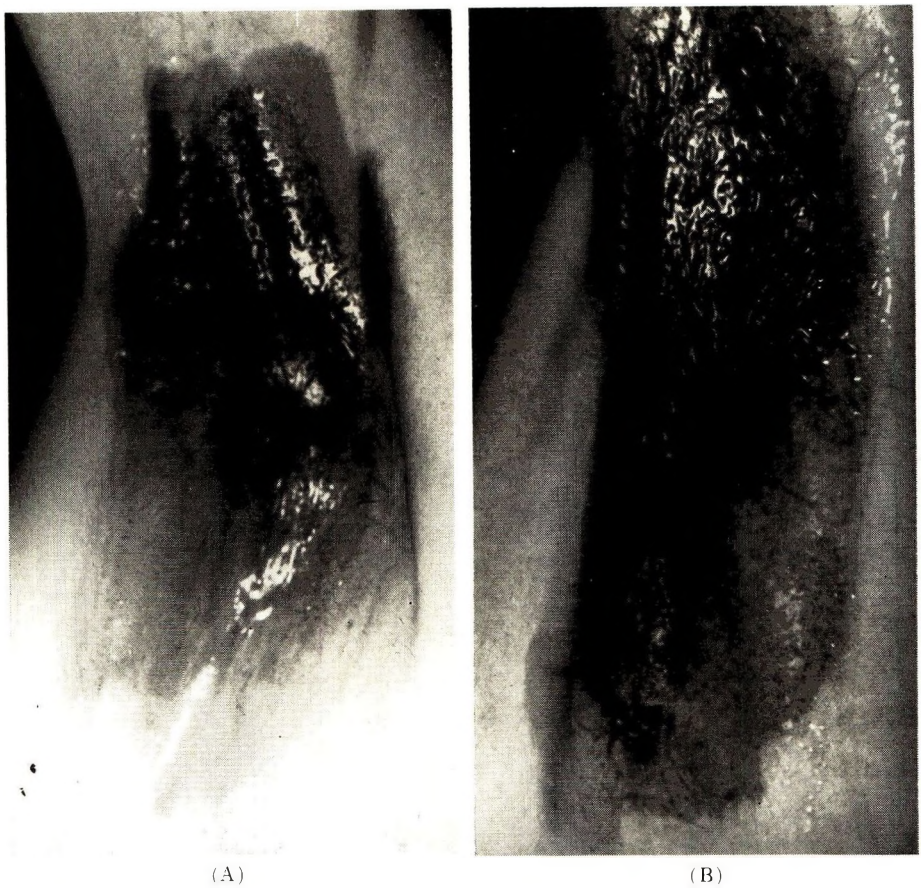
Figure 3. Unilateral beard growth by topical testosterone. The left side of the face of this 84-year-old white woman was treated with the hormone for 1½ years, while its cream vehicle was similarly applied to the right side. The mustache was present beforehand, as were a few wisps of hair on the chin. This again shows the purely local action of the topically applied steroid

both to earlier recruitment and an increased density of functioning glands (Fig. 4).

Progesterone-treated sites demonstrated effects qualitatively similar to those of testosterone but of a lower order of magnitude. Pregnenolone acetate, while also working in the same direction, was considerably weaker in effect. Estrogens produced no observable improvement in the aged skin and, if anything, tended to suppress both hair growth and eccrine sweating in the axilla.

The corticosteroid hormones unequivocally accentuated the defects of senescence. The skin became thinner, atrophic, and even more lax. Spontaneous petechiae developed in the axilla, while the forearm displayed the identical likeness to senile purpura (Fig. 5). Hair growth in the axilla diminished. Triamcinolone acetonide suppressed eccrine function, and fluocinolone acetonide stimulated sweating.

Thus, in regard to gross structure and function, testosterone, progesterone, and pregnenolone, in that order, have a general rejuvenating effect on senescent skin. On the other hand, estrogen mildly accentuated some of the aging characteristics, while the corticosteroids profoundly increased the degradative alterations.



(A) (B)

Figure 4. The effect of topical testosterone on eccrine function as demonstrated by use of Wada's iodine-starch-castor oil technique. Sweat droplets appear as black puncta trapped beneath the oil. The control side (A) clearly demonstrates the diminished activity seen in the aging axilla. (Subject is a 75-year-old white man.) The contralateral, testosterone treated area (B), however, has greatly increased sweating

Histologic Changes in Aging Skin

Most impressive of the structural changes are the marked thinning and flattening of the epidermis. It is composed of cells which display great irregularity with marked discrepancy in size, shape, and staining properties. The cytoplasm of the prickle cells often condenses in the periphery, leaving perinuclear halos. The nucleus is often small and darkly stained, and the nuceoli are obscured. The orderly progression of cells from the basal layer to the surface is often disrupted, with considerable loss in cell polarity (Fig. 6A). Under the light microscopy,

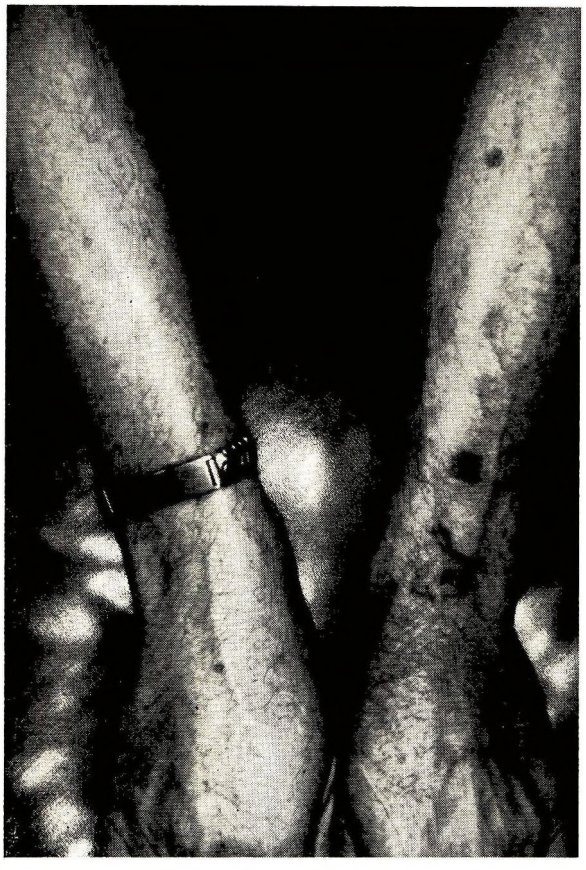
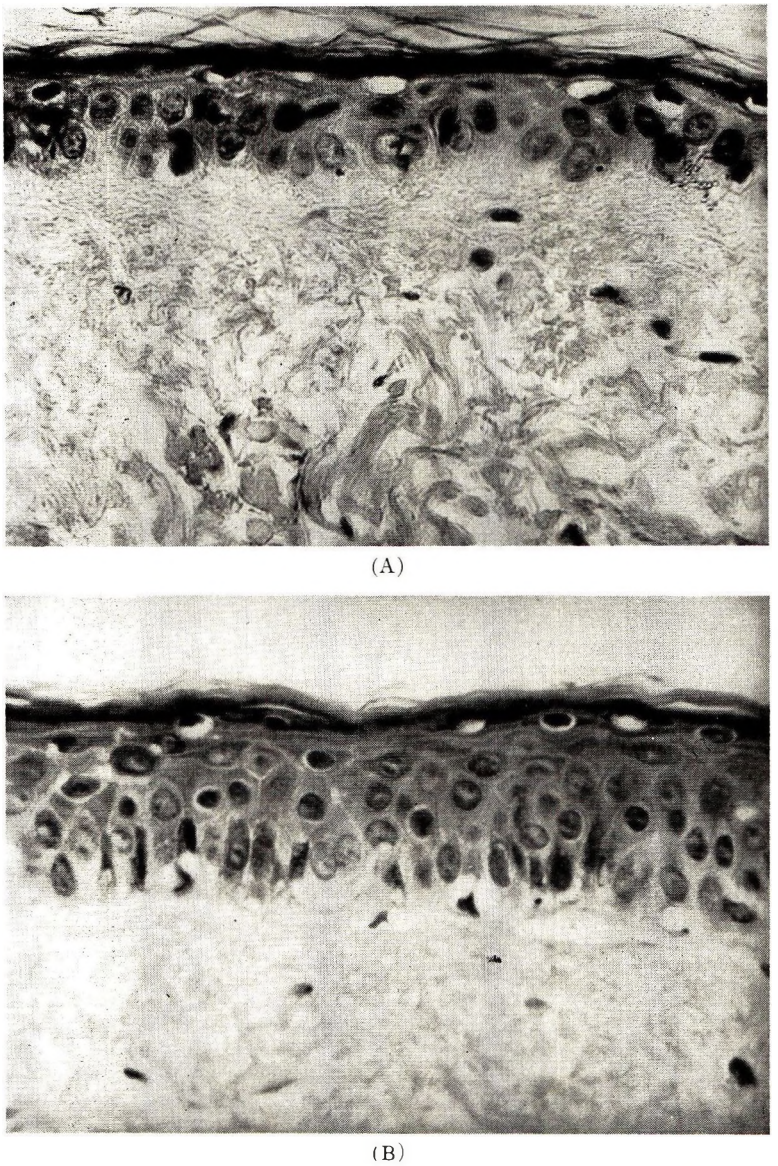


Figure 5. Senile purpura-like lesions produced by topical application of corticosteroids. The left extensor forearm has been treated with triamcinolone acetonide cream for one year, the right with its control vehicle

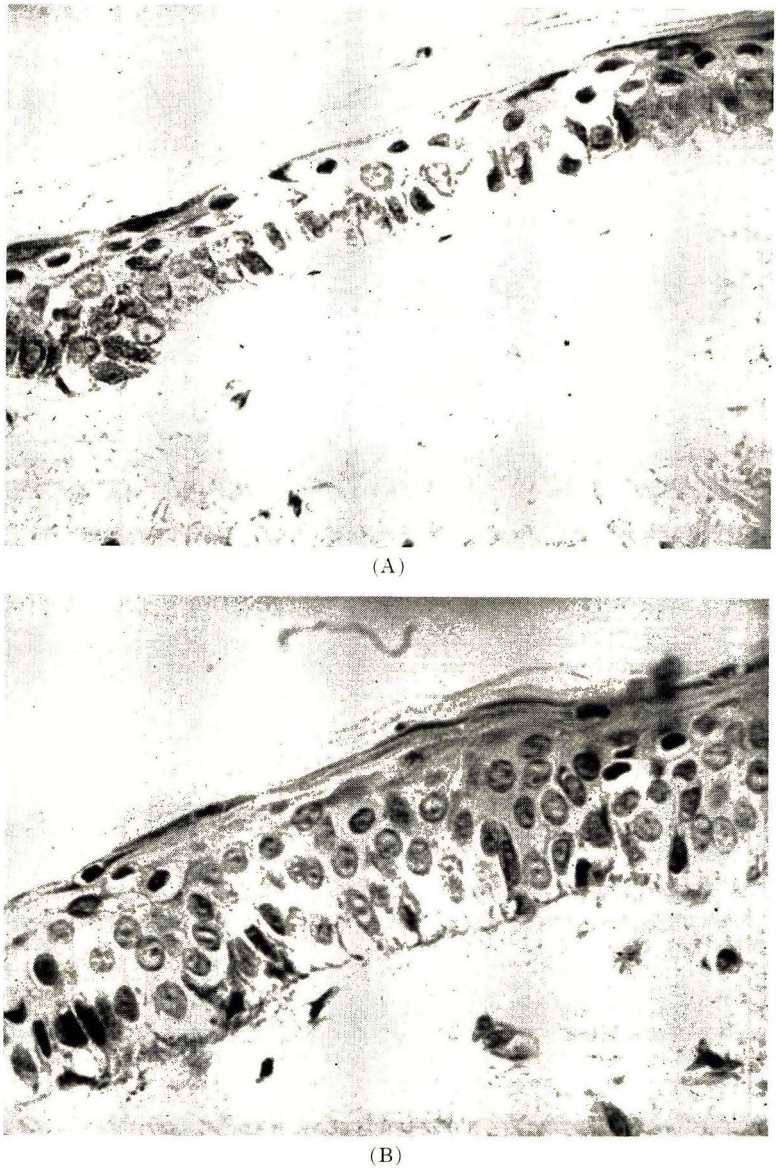
the basement membrane, which normally is a sharp, serrated structure inserting into the basal layer at the dermo-epidermal junction, appears as a blunted, hazy, attenuated, and discontinuous structure (Fig. 7A). Dermal degradation is most prominent in the sun-exposed sites. Murky masses of dense, basophilic, elastotic material occupy the major portion of the dermis, sparing but a thin subepidermal zone. Elastic staining, particularly in thick sections, reveals a tangled skein of coarse fibers, while the delicate, finely branched subepidermal strands are reduced. The acid mucopolysaccharide (AMP) ground substance, defined by Hale staining, is greatly diminished, surviving in small quantity in the papillary dermis. Correspondingly, there exists a depletion of fibro-



(A)

(B)

Figure 6. Enhancement of epidermal structure by testosterone. The control specimen (A) from the face of an 80-year-old white woman typifies the chaotic, atrophic epidermis of exposed aged skin. Some of the degradative dermal changes are also evident. The testosterone-treated side (B) has undergone remarkable "rejuvenation." Both specimens are photographed at the identical magnification. (H & E ×400)

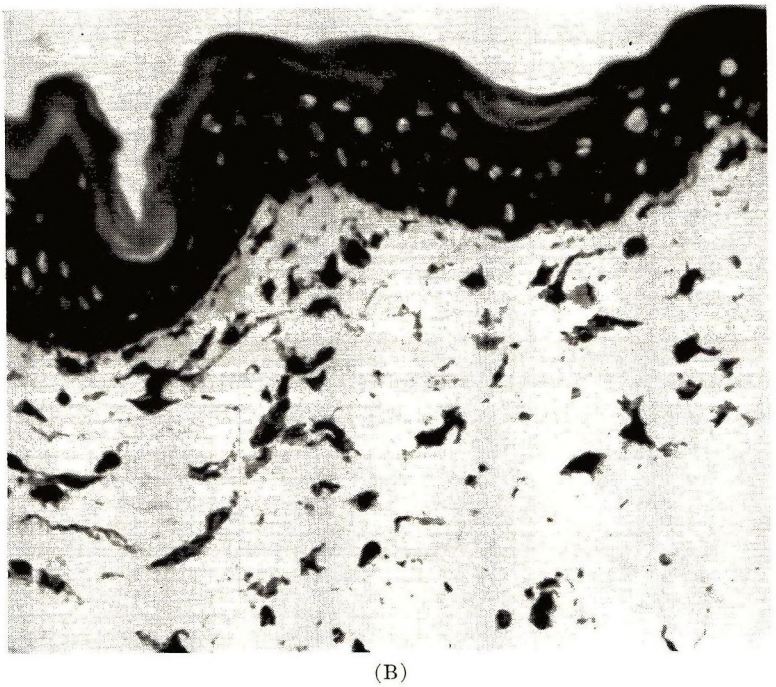


(A)

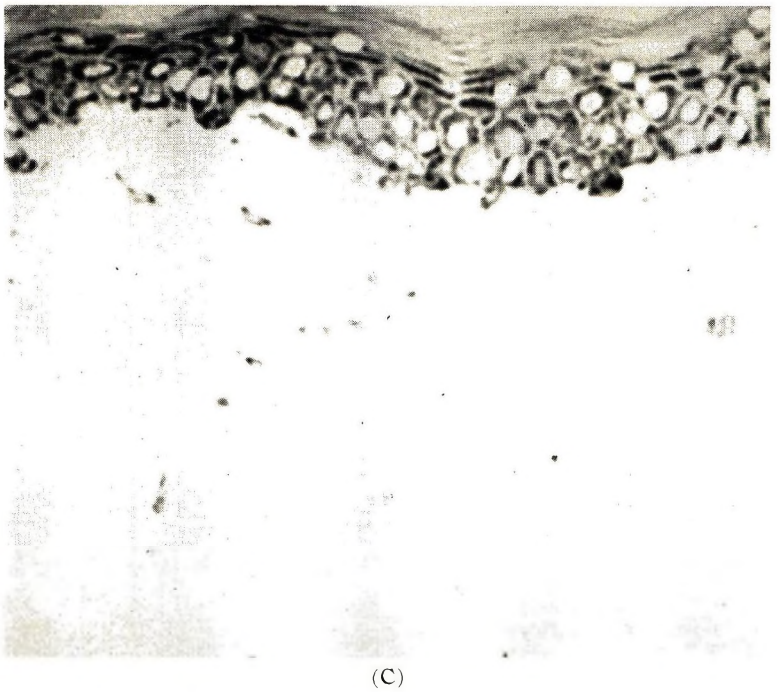
(B)

Figure 7. Effect of topical testosterone on the basement membrane. The control site (A) from the face of an 80-year-white woman shows a much attenuated, discontinuous structure that is barely visible. The hormone treated skin (B) demonstrates a fine, serrated band of PAS positive material along the length of the dermo-epidermal junction. (Original magnification 400×)

(A)



(B)



(C)

Figure 8. Hormonal effect on dermal cells. The control specimen (A) exhibits the characteristic bipolar, spindle shaped fibroblasts, packed in parallel bundles at the upper portions of the dermis. Testosterone treatment (B) causes the cells to assume a more blast-like, stellate form, and they are found more uniformly distributed throughout the dermis. Topical corticosteroids cause a marked diminution on the cell population (C). Either the fibrocytes are not staining or their numbers have been reduced. The relative diphosphopyridine nucleotide diaphorase (DPND) activity in the epidermis is also seen with this enzyme preparation. (Original magnification 200×)

cytes, which are shrunken to skimpy, bipolar forms packed in parallel bundles within the Hale staining areas (Fig. 8A).

Histologic Results of Steroid Application

The microscopic structural improvements following the application of hormones are far more impressive than those appreciated with the unaided eye. These alterations are readily apparent in the majority of subjects (about 75%), including many individuals who showed no clinical modifications. The tenor of the testosterone effect, and that of progesterone and pregnenolone to a lesser degree, was toward a more youthful architecture. Thickening of the treated epidermis (through increase in cell size and number of cell layers) occurred to an extent which made it appear as though it had been viewed at a higher

magnification than its control specimen. Regularity in cell size and shape was restored, nuclear and cytoplasmic content seemed plumper, and nucleoli became distinct. Stratification of cells throughout the epidermis was restored to the normal pattern (Fig. 6B). The basement membrane thickened perceptibly, stained more vividly, and became sharply defined and unbroken (Fig. 7B).

The dermis showed increased AMP staining of deeper hue and broader distribution. There was an accompanying alteration in the morphology of the fibrocytes, which resumed a plump stellate form and were found dispersed throughout the dermis (Fig. 8B). The heavy material of basophilic degeneration appeared diluted or washed out by the increased AMP. In a similar fashion, the coarse tangles of elastic tissue appeared more separated and were pushed further away from the papillary dermis. This subepidermal zone now contained numerous fine elastic fibers which ran perpendicularly to the dermo-epidermal junction.

Estrogen-treated tissues could not be distinguished from the controls. As with the clinical results, the corticosteroids produced degradative changes easily seen by microscopic examination. The epidermis became uniformly atrophic and was often reduced to a structure of only several cell layers' depth. The basement membrane suffered further washout and became more indistinct. Decimation of the cell population of the dermis (Fig. 8C) was accompanied by diminished AMP staining. The subepidermal orcein staining fibers were little changed following corticosteroid treatment.

Discussion

These studies indicate that topically applied steroid hormones can produce definite alterations in aging human skin. Androgens primarily tend to ameliorate the degradative changes, while the corticosteroids further exaggerate the deterioration. Exactly how these modifications develop is not yet known, and perhaps study of the mechanisms may provide insight into the aging process itself. Cutaneous senescence at least appears to have been conveniently bracketed by this divergent action of structurally related chemicals.

One fact which is clear is that the observed results are entirely local. Similar effects on distant or neighboring untreated skin do not occur. Systemic administration of the hormones in therapeutic amounts over an extended time are also ineffective (3). Of all the steroids used, only the estrogen showed significant absorption as such, with general effects

such as gynecomastia in men and resumption of uterine bleeding in postmenopausal women.

Apparently the application of pharmacologic quantities of hormones to the skin yields unique results which cannot be predicted from knowledge of their usual physiologic and systemic effects. It is becoming evident that cutaneous pathways of metabolism for steroids exist and that much remains to be learned of their integumentary fate (4–8). It is clear, however, that hasty generalizations drawn from "expected results" can be misleading. The reliance on topically applied female hormones to alleviate the defects of aging skin undoubtedly draws support from this type of reasoning.

With regard to the practical implications of our studies, it is of course most encouraging to have achieved even these modest changes on skin which was already markedly damaged. This strongly suggests that prophylaxis might well yield even more satisfactory results. It is conceivable that application of the appropriate steroid begun rather early in life, particularly in light skinned, susceptible individuals, might not only enhance their appearance in later years but also afford protection against the development of cutaneous epitheliomas.

Summary

The characteristic structural changes which typify aged skin, both in protected and actinically damaged areas, can be modified by the topical application of steroidal hormones. Androgenic compounds exert an ameliorative effect, restoring the gross and microscopic architecture toward a more youthful integument. Hair growth is stimulated, sweat secretion increased and, in some instances, the sagging and fine wrinkling of senescence effaced. The microscopic improvement is even more uniform and striking, particularly in the epidermis where the disorderly cytologic and histologic alterations are reversed. The "beneficial" effects of topical estrogen have not been confirmed, and such substances exert no appreciable activity on human skin. Corticosteroid action is diametrically opposite to that of the androgens, and topical administration accentuates the degradative changes.

Acknowledgment

Particular appreciation is acknowledged to the administration (Raymond S. Groller, Director) and the residents of Riverview Home for the Aged who participated in this study.

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References

(1) Montagna, W., Formisano, V., and Kligman, A. M. Hormonal factors in aging. *Hormonal Steroids, Biochemistry, Pharmacology and Therapeutics: Proceedings of the First International Congress on Hormonal Steroids.* Vol. 1, pp 559–568, Academic Press, New York, 1964.

(2) Papa, C. M. and Kligman, A. M. The effect of topical steroids on the aged human axilla, in Montagna, W., *Advances in Biology of Skin-Aging,* Pergamon Press, New York, 1965.

(3) Formisano, V., and Kligman, A. M., Modification of human aged skin by sex steroids. (In press)

(4) Wotiz, H. H., Mescon, H., Doppel, H., and Lemon, H. M., The *in vitro* metabolism of testosterone by human skin, *J. Invest. Dermatol.*, **20,** 113 (1956).

(5) Baillie, A. H., Calman, K. C., and Milne, J. A., Histochemical distribution of hydroxysteroid dehydrogenases in human skin, *Brit. J. Dermtaol.* **77,** 610 (1965).

(6) Gomez, E. C., and Hsia, S. C., Studies in cutaneous metabolism of testosterone 4-C^{14} *Federation Proc.*, **25,** 282 (1966).

(7) Hsia, S. L., Witten, V. H., and Hao, Y. L., *In vitro* metabolic studies of hydrocortisone-4-C^{14} in human skin. *J. Invest. Dermatol.* **43, 407** (1964).

(8) Frost, P., Weinstein, G. D., and Hsia, S. L. Metabolism of estradiol-17^{B} and estrone in human skin. *Ibid.*, **46,** 584 (1966).

J. Soc. Cosmetic Chemists, **18**, 563–568 (Aug. 19, 1967)

The Human Scalp as a Habitat for Molds*

CLAYTON T. SHAW, M. S., ** and
RAYMOND W. VANDERWYK, Ph.D.†

Synopsis—Ninety molds, representing 31 different species, including four known pathogens, have been isolated from the scalps of 100 individuals known to have dandruff. The isolation methods, identifying procedures and significance of the findings are discussed.

Introduction

There has been much interest in the isolation and identification of microorganisms from the human scalp in the last ten years because of their possible association with the scalp condition, "dandruff." It is believed by some investigators that dandruff is caused by a microorganism or group of microorganisms.

The human scalp offers an environment that is favorable for the growth of many types of microorganisms both aerobic and anaerobic. Investigation by Roia (1) has shown that at least 14 separate yeasts are often found on the scalp. Beal (2) isolated 16 aerobic bacteria, and Epstein (3) demonstrated that seven species of bacteria normally associated with the human intestinal tract are also found on the scalp.

Presently, study of the flora of the scalp is concerned primarily with the isolation and identification of the group of fungi known as molds. Although many species of molds are known to be air contaminants, it has not been shown that these molds are parasitic to man. However, some of the molds belong to genera that are known to be pathogenic.

* Research supported by a grant from John H. Breck, Inc.
** Department of Public Health, University of Massachusetts, Amherst, Mass. 01002.
† Department of Microbiology, Massachusetts College of Pharmacy, Boston, Mass. 02115.

For 125 years fungi have been known to produce disease in man and animals (4). Before 1930 many fungus diseases were infectants in a small region of the country, but after 1930 an important cause for the spreading of fungus diseases as well as other diseases was the migration of people from one area to another. Some of the reasons for this great migration were economic depression and the great drought that occurred in the Midwest during the 1930's. The Second World War also caused a great deal of moving, both of industries and of the employees of the industrial plants.

The fungi of most concern are the keratinophilic fungi. These fungi are best known because of their relationship to certain dermatomycoses such as athlete's foot and ringworm of the scalp. These fungi are strongly keratinolytic and degrade keratin by an enzyme system (4). This enzyme system is not fully understood, and successful tests of keratin *in vivo* are difficult.

The keratinophilic fungi of the Gymnoascaceae have been studied extensively. Members of this family include *Trichophyton mentagrophytes*, *Microsporum gypseum*, and *Microsporum audouini*. There is little doubt that the infections caused by the keratinophilic fungi are spread from infected to healthy persons by either direct or indirect transfer of arthrospores or keratin that contains the fungus.

The need for knowledge of the microorganisms of the scalp and of their role in dandruff is of great importance to the manufacturers of hair preparations, such as medicated shampoos, hair rinses, and hair dressings. These types of products have been marketed by many companies in recent years. Their value is often questionable and almost always incomplete because of the lack of information about the effectiveness of the product against the organisms that are found on the scalp. It is the purpose of this study to investigate the connection, if any, of the molds found on the scalp with the presence of dandruff.

Experimental

A group of 100 persons was studied. It consisted of members of the senior and third-year classes at the Massachusetts College of Pharmacy between September, 1963, and June, 1964, of members of the faculty, and of people taken at random from outside this College. Twelve of the subjects were females. The subjects were not considered to have any abnormal scalp condition. They ranged in age from 17 to 66 years.

The material used in this study is known as "scurf." A scurf sample was obtained from each subject by having each person scratch his

scalp with his fingernails and by allowing some scurf to fall upon a culture medium. Each subject selected the area of scalp of his choice. It was assumed that a representative sample from all parts of the scalp was obtained.

Identification of Molds

Culture Technique

The culture medium used for the primary isolation was Sabouraud dextrose agar (Difco pH 5.6). To prevent the growth of yeasts and bacteria, neomycin (3 mg/ml) and nystatin (5 units/ml) were added to this medium.

Primary isolations were made in Petri plates having a diameter of 90 mm. Subsequently subcultures were made in smaller Petri plates (diameter 45 mm). These subcultures were grown on Sabouraud antibiotic agar, except for the molds of the genus *Penicillium*, which were grown on Czapek dox agar (Difco pH 7.3). All mold subcultures were grown from ten to fourteen days in the dark at 25 °C.

The cultural characteristics most useful in identification were the following:

1. *Colony Growth:* The rapidity of growth and the size of the colony at maturity is important.
2. *Colony Surface:* The colony surface could be velvety, floccose (wooly), funiculose ,or fasciculate. Ridges and furrows oriented in a radiating or concentric manner demarcated the colony into well-defined zones (zonate).
3. *Colony Margin:* The colony margin could be undulating or entire.
4. *Colony Color:* The chromogenicity of the aerial parts, including hyphae, conidiophores, and conidia, was observed. Sometimes the medium surrounding the colony became colored by soluble pigments, which was an important consideration.
5. *Spores:* The degree of sporulation and the spore color were important in designating species.
6. *Exudates:* Droplets of liquid appearing on the surface of the colony were often seen. These droplets varied in number, clarity, and pigmentation.
7. *Odor:* The odors produced by molds varied considerably and were characteristic.

8. *Undersurface of Colony:* As the mold hyphae grow into the agar, characteristic colors were sometimes produced which could be observed by examining the underside of the colony.

Microscopic Technique

Wet Mount

A 3 mm plug of agar-containing mold was placed on a slide, 5% KOH was added, sufficient heat was applied to melt the agar, and a cover slip was pressed upon the material before microscopic examination.

Slide Culture

Shoemaker fungus microculture slides were inoculated with all available molds with cornmeal agar (Difco pH 6.0) as the nutrient. In most cultures sporulation was seen, following a ten to fourteen day incubation period at 25 °C.

The microscopic characteristics which were most useful in the identification of the majority of molds, especially the *Penicillium* and the *Aspergillus* were the following:

Head	Hulle cells, perithecia, ascospores, and sclerotia
Foot-cell	
Vesicle	Metulae
Conidiophore or stalk	Chlamydospores
Sterigmata	Stromata
Conidium or spore	Vegetative mycelium

Results

Molds capable of growing on Sabouraud agar were isolated from the scalps of 55 of the 100 subjects tested in the survey. In some cases more than one mold was present in the scalp of the same person, resulting in a total of 90 identifiable molds which could be maintained in subculture.

Thirty-one different species of molds were identified from the scalps of 100 subjects (Table I). Only four of the isolated scalp molds have been reported to be associated with human pathological conditions. These are *Aspergillus versicolor*, *A. fumigatus*, *A. awamori*, and *A. miyakoensis* (5). Pathogenicity studies of mold scalp isolates were not carried out in this research.

The most frequent organism, one that was isolated from the scalp of

13 subjects, was *Penicillium notatum*. Other common molds were *Alternaria senecionis*, in the scalps of ten subjects, and *P. brevi-compactum*, in the scalps of six subjects.

Aspergillus awamori and *Aspergillus miyakoensis* belong to the *Aspergillus niger* group. Members of this group are commonly isolated from the external ear of man. The black aspergilli are the most common of all aspergilli. They are of world-wide distribution and occur in and upon the greatest variety of substrata, including grains, fabrics, leather, and decaying vegetation in the field.

Table I

Identifiable Molds Isolated from the Scalps of 100 Humans

Organism	Number of Isolates
Alternaria senecionis	10
Aspergillus awamori	1
Aspergillus fumigatus	1
Aspergillus miyakoensis	2
Aspergillus terricola var. *americana*	1
Aspergillus versicolor	1
Cladosporium avellaneum	2
Cladosporium cladosporioides	2
Cladosporium sphaerospermum	4
Helminthosporium halodes	2
Mucor circinelloides	2
Penicillium albidum	2
Penicillium brevi-compactum	6
Penicillium chrysogenum	2
Penicillium citrinum	4
Penicillium commune	2
Penicillium expansum	2
Penicillium frequentans	4
Penicillium implicatum	4
Penicillium lanoso-coeruleum	1
Penicillium lilacinum	1
Penicillium lividum	4
Penicillium nalgiovensis	1
Penicillium notatum	13
Penicillium oxalicum	1
Penicillium paxilli	5
Penicillium roqueforti	2
Penicillium soppi	1
Penicillium vermiculatum	3
Pseudostemphylium lanuginosum	2
Pullularia pullulans	2
Total	90

The *Aspergillus tamarri* series is not widely distributed, nor it is particularly common. It has been isolated from soil and from decaying organic material. It has no pathogenicity and may be regarded only as a saprophyte. The only species isolated belonging to this series was *Aspergillus terricola* var. *americana*.

Aspergillus versicolor var. *glauca* was isolated from human skin showing "ringworm," but pathogenicity was not proved experimentally (5). It is often found upon dried salted lean beef, thus showing its ability to grow upon meat products. It has been isolated from other, "non-meaty" places, such as bread, cereals, old cheese, rubber, and paraffins. These molds are widely distributed.

Summary

1. The mold flora of the scalps of 100 people has been investigated.

2. From 55 of these people, a total of 90 molds were isolated by culture and were identified according to monographs found in the literature.

3. The 90 molds were represented by 31 species.

4. The three most prevalent molds were *Penicillium notatum*, *Alternaria senecionis*, and *Penicillium brevi-compactum*.

5. Four of the 31 molds isolated are known to be pathogenic to man. The rest are plant saprophytes or parasites as well, responsible for the decomposition of organic materials.

6. There is no evidence in the literature to show that any of the molds isolated may cause any specific pathological condition of the scalp.

7. This survey shows that the human scalp harbors molds in great abundance.

(Received October 10, 1966)

References

(1) Roia, F. C., VanderWyk, R. W., and Beal, J. A., The human scalp as a habitat for yeasts, *J. Soc. Cosmetic Chemists*, **14**, 81 (1963).

(2) Beal, J. A., Isolation and classification of aerobic bacteria from the human scalp. Master of Science Thesis, Massachusetts College of Pharmacy, 1962.

(3) Epstein, J. M., The isolation and identification of fecal organisms from the human scalp. Master of Science Thesis, Massachusetts College of Pharmacy, 1963.

(4) Delldorf, G., *Fungi and Fungus Diseases*, Charles C Thomas, Springfield, Ill., 1963.

(5) Raper, K. B., and Thom, C., *A Manual of Aspergilli*, Williams and Wilkins, Baltimore, Md., 1945.

Book Reviews

THE CHEMICAL FORMULARY, VOLUME XIII, edited by H. Bennett. Chemical Publishing Co., Inc., New York. 1967. 447 pages, indexed. Price $8.

The 13th edition of the now familiar series of chemical formulary brings countless new formulas in sixteen broad areas to the chemical and amateur formulator. The first chapter again presents the well-known basic principles for compounding the formulations and is a fitting introduction for the volume, as well as a source of useful recipes. While several of the topics found in volume XII are included in volume XIII, none of the formulas are duplicated, and a large number of new fields are surveyed as well.

The formulations are for the most part grouped under appropriate subject headings, making it easy to browse through and compare. However, industrial disinfectant cleaners are misplaced in Chapter IV, "Cosmetics and Drugs," and should rightfully be in Chapter XIV, "Soaps and Cleaners." Hard surface disinfectants are not drugs. Chapter V, "Emulsions," contains one formula for a self-polishing floor wax which should be included in Chapter XI, "Polish," although admittedly it is an emulsion. Chapter XVI, "Miscellaneous," includes a number of unrelated items. Fortunately, the index is complete and fairly accurate and directs one to the proper pages.

Especially helpful are the alphabetical lists of chemicals and suppliers, which make it easy to locate the source of raw materials. The writer agrees with the editors of the volume that trade names for materials should be used to afford as many meaningful formulas as possible, but a description of the products should also be included so that a formula can be evaluated. There is no way of knowing, for example, whether a material is an active ingredient, a filler, a preservative, or an activator unless one is already familiar with it. Several formulas are simply composed of a dozen specialty items giving no clue to their nature. As far as could be determined, only one material, Detergicide (page 121), is not listed among the chemicals.

Most of the chapters are well written, with both formulas and compounding procedure spelled out. Chapter XIII, "Rubber, Plastics, Waxes," is one exception—with formula upon formula and never a manu-

facturing procedure, time, or temperature—and could be useful only to an expert. The chapter on soaps and cleaners is occasionally difficult to read because formulas are broken up and the continuation may be found at the top of the next column or part way through, since the printing varies haphazardly from two columns per page to one.

Chapter XII, "Pyrotechnics," is a disappointment because it is merely a detailed summary of one U. S. patent on halogenic smokes. Such a narrow phase of a subject should not have over 50 pages devoted to it.

The formulas for the kinds of products with which the writer is familiar appear reasonable and workable with the exception of artificial vanilla, page 28. Coumarin has been banned for use in foods as a toxic adulterant by the FDA and, of course, cannot be used.

The cosmetic chemist will find in Chapter IV, "Cosmetics and Drugs," a wealth of information since it includes typical formulations for almost every kind of cosmetic and toilet article which can serve as starting points for his own work, while the other chapters can supply new ideas and raw materials. Volume XIII of *The Chemical Formulary* is a valuable addition to the shelf of the formulating chemist.—RICHARD K. LEHNE—Cyanamid International.

SCIENTISTS IN ORGANIZATIONS, by Donald C. Pelz and Frank M. Andrews. John Wiley & Sons, Inc., New York, N. Y. 1966. 318 pages, indexed. Price $10.

This volume describes the results of a massive study of scientists by two social psychologists. One may expect that it will be much quoted and will become a major source of important information to managers of research and development groups. Basically, the authors studied research personnel in industrial and governmental laboratories and in universities. The subjects were 1311 scientists in 11 different laboratories.

Scientists were rated according to their performance in four categories: scientific contributions, usefulness, patents, and unpublished reports. The ratings in the last two categories appear of minor interest, but the areas identified as scientific contributions and usefulness deserve careful scrutiny. "Scientific contributions" refer to the man's own work to help the field move forward, regardless of whether anybody benefits from his activity. "Usefulness" refers to his value to the organization within which he works, regardless of whether he himself performs the research or service. Ratings of these parameters were made by five judges, on the average, selected from the scientists's peers within his own laboratory. These ratings were then combined by the "Ford" technique to yield percentile ranks. It is interesting to note that these two parameters generally run parallel and that one measurement might have been sufficient. One can, therefore, inquire whether these parameters measure different characteristics of individuals or whether the judges tend to confuse these two particular ratings.

It is desirable, of course, to surround scientists with an environment which makes their performance as productive as possible. The findings of this study actually suggest management techniques which would allow a scientist to achieve his full potential. Interestingly enough, scientists perform better when their activities were fairly thoroughly coordinated and when their "freedom" was somewhat limited. Similarly, higher performance was achieved whenever there was communication with colleagues and whenever the scientist was allowed to work on three or four research and development functions; a sharp lowering of performance was noted whenever the number of functions exceeded four. Some other interesting findings reported by the authors concern the influence of the age of the scientists, the time spent in technical work, and laboratory conditions.

In reviewing this massive accumulation of statistical data, one is struck by the fact that scientists appear to perform better if, as noted above, management employs certain administrative techniques. The question arises whether it is legitimate to assume that the caliber of sceintists in the various laboratories is homogeneous and that comparisons between different laboratories are meaningful. It is quite possible that good management practices attract or find the more highly endowed and effective scientist; poorer management may be satisfied with less capable individuals. Although the book does not answer this puzzling problem, scientists and administrators can benefit much from this significant contribution because it describes either how to attract the well-performing scientist or how to make scientists perform well.—M. M. RIEGER—Warner-Lambert Research Institute.

COLLOID CHEMISTRY, by A. Sheludko, Elsevier Publishing Company, Amsterdam, London, New York. 1966. 277 pages. Price $14.50.

This book was developed from the lectures given by Dr. Sheludko, Professor of Physical Chemistry at the University of Sofia, Bulgaria. The Bulgarian text (1957–58) was revised and translated into Russian in 1960. This material was further revised in the translation to English. The subject is developed from basic principles. Where needed, an adequate mathematical background is assumed. The whole exposition is very readable.

Each chapter is well referenced. The index is confined to major topics only. It is an excellent book for use as a colloid text or as a small reference book. The chapter titles—Preparation and Purification of Lyophobic Colloidal Systems, The Optical Properties of Colloids, The Molecular Kinetic Properties of Colloidal Solutions, Physical Chemistry of Surfaces, Electrokinetic Phenomena, Thin Layers, Stability of Lyophobic Sols, and Foams and Emulsions—give an idea of the scope of the book. Considering the total size of the book, the coverage of the more applied areas of the last three chapters is very complete and is a remarkably concise ex-

position of the theories involved in a very controversial area.

The fact that this book was written as a teaching text makes it a desirable book for anyone approaching a study of colloid chemistry, particularly for self-education on the background of the many phenomena so important to the cosmetic chemist.—JOHN H. WOOD—Bristol-Myers Products.

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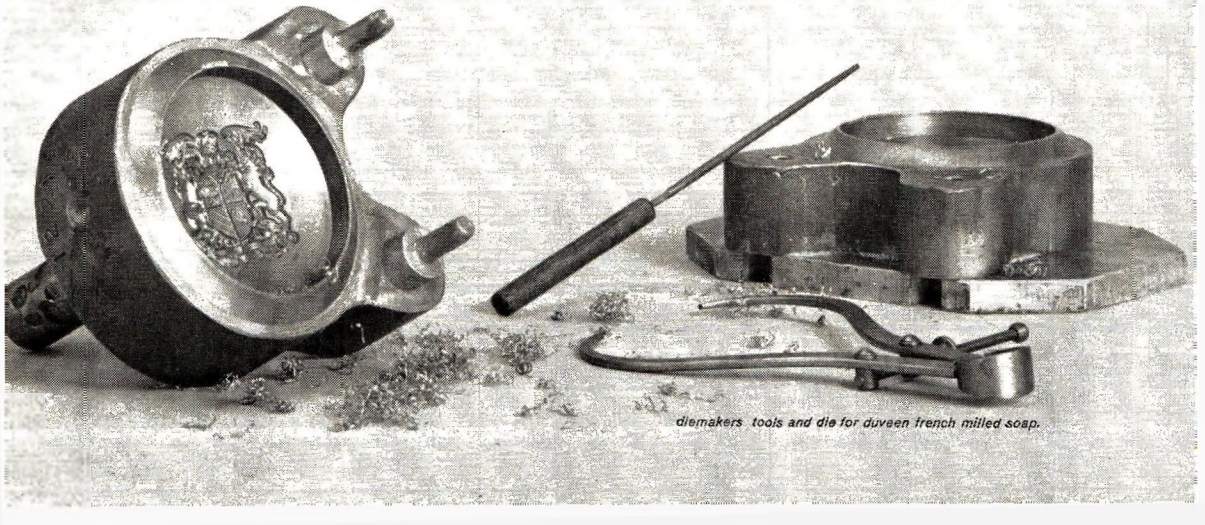

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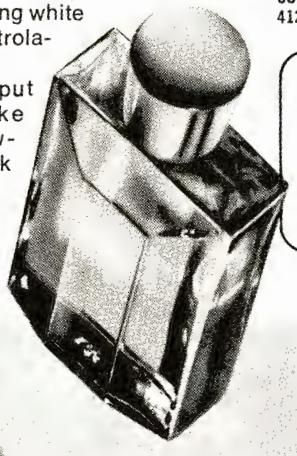

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