tor; however, as new organic chemical technology shifted from aromatic to aliphatic compounds, organic chemical production gradually shifted from fine organic chemicals—dyes, pharmaceuticals, and photographic chemicals—to heavy organic chemicals—plastics, synthetic fibers, and petrochemicals. This major change in chemical technology in the late 1930's and the 1940's provided ICI with the opportunity to enter this sector successfully. Accordingly the old dyestuffs division came to play a more central role in ICI's research, investment, and sales. ICI's ability to shift gradually from traditional lines into new sectors of the industry derived in large part from the conditions fostered by the cartel system of the 1930's. First, ICI acquired under the terms of the cartel agreements new technical capacities and products from other firms such as Du Pont. Second, the cartel agreements that set prices and sales quotas provided little opportunity for sales and profit growth except through the development of novel products. Hence in the 1920's and 1930's these agreements fostered research competition among the participants, which eventually led to entirely new lines of products.

World War II strained ICI's research program and the cartel system. In the wake of the war the cartel system collapsed and the special relationship between ICI and Du Pont ceased as a consequence of the enforcement of the United States antitrust laws. As the technical revolution became manifest, research and production shifted markedly into the organic sector. Nevertheless, the company found it difficult to change as rapidly as it might have. Consequently, the heavy chemicals end of the organic chemicals spectrum predominated in ICI's production, not because of technical incompetence in fine chemicals, but because of the vicissitudes of the war and the lack of adaptability in ICI's organizational structure, a structure that continued to reflect the company's traditional technologies and interests rather than contemporary opportunities. This problem continued to plague ICI well after the termination date of this history.

Reader and his assistants have successfully faced the Herculean task of making the complex and wide-ranging activities of this large enterprise during a period of technical revolution both comprehensible and interesting. Although the chronological overlapping of the major divisions of the book produces disjointedness and redundancy, Reader has gained, in comparison with his first volume, a better treatment of organizational structure, managerial personnel, labor relations, and research and development activities. As in the earlier volume, he has effectively employed a large number of photographs, tables, charts, and maps and has produced a very complete index and technical glossary. While his treatment of the role of technology and science in the evolution and direction of a large industrial enterprise is important, the two-volume study may be of even more enduring significance as an example of the successful union of enlightened business attitudes toward corporate history and of good historical scholarship applied to a technically oriented company and industry. In that respect it is an example to be emulated.

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Capitalizing on Invention

Images and Enterprise. Technology and the American Photographic Industry, 1839–1925. REESE V. JENKINS. Johns Hopkins University Press, Baltimore, 1975. xviii, 372 pp., illus. $20. Johns Hopkins Studies in the History of Technology.

Photography was born in 1839, when art and science combined in the collaboration of Joseph Niepce and Louis Daguerre to capture permanently in silver grains what the eye sees fleetingly. It was at once hailed as a great cultural contribution too precious to vulgarize commercially and hence was given to all mankind through open publication by the French government, which recompensed the inventors with handsome pensions. For a decade or less the new discovery inspired intense photochemical research, but, as no major new finds ensued, scientific interest waned. Such was not the case among practitioners of the new photographic art or the public, however. In the United States great enthusiasm developed for daguerreotypes, for they provided portraits truer to life than painting at a price ordinary folks could afford. Itinerant daguerreotypists and photo galleries multiplied across the land. They were supplied by an infant photographic industry.

The subsequent development of that industry, as recounted by Reese Jenkins, was determined primarily by a succession of technical innovations. Not that Jenkins slights other more general factors (economic, organizational, legal, and so on), for he treats these and their interaction with technology with subtlety and authority, but he shows convincingly that for the photographic industry their role was secondary. And within the technical sphere Jenkins identifies the carrier base for the photosensitive material (the plate and later the film) as the most important determinant in shaping the destiny of the industry. Photochemicals, developing and printing techniques, and cameras with their complex optical and shutter components, though every bit as important in advancing the art of photography, were less significant in determining the course of the industry, at least in the United States.

Having thus isolated the most critical factor, Jenkins proceeds to organize his book neatly into five sections corresponding to five historic stages, each dominated by a different carrier base: the daguerreotype, 1839–1855; collodion emulsion on glass plates, 1855–1880; gelatin plates, 1880–1895; roll films for amateurs, 1895–1909; cinematography, 1909–1925.

Both the daguerreotype and the collodion plate required sensitizing just before exposure and had to be developed immediately; hence the photographer needed to be a skilled technician operating ponderous equipment. He drew his supplies from local dealers, who in turn obtained their goods from regional jobbers such as the Scovill Company and Edward Anthony in New York. Unlike the daguerreotype, the collodion process produced a negative plate from which any number of prints could be made on paper. Until 1880 most innovations came from Europe. For instance, in the 1870's the gelatin dry plate was invented by Maddox in England. It could be prepared efficiently in a factory months before use and after exposure could wait for development. This simplified photography to the point where knowledgeable amateurs could practice the art.

George Eastman (1854–1932) was such an amateur. In 1881 he decided to quit clerking in a bank to manufacture dry plates. Possessing a remarkably balanced combination of technical and business talent, Eastman did for photography what Henry Ford did for the automobile; he democratized picture-taking. His machine for making gelatin dry plate was the first step to mass production and worldwide sales. It was followed in the 1890's by his development of celluloid roll film mounted on removable spools inside his now famed Kodak box camera. Through a bewildering succession of pat-

ent acquisitions, pools, mergers that integrated his mushrooming business forward, backward, and laterally, he had, by 1910, snuffed out all but token competitors, whom only fear of the antitrust laws obliged him to indulge. Elsewhere in the world his enterprises registered similar triumphs. His work was crowned by the advent of cinematography, for which his company supplied reels of film of unsurpassed quality.

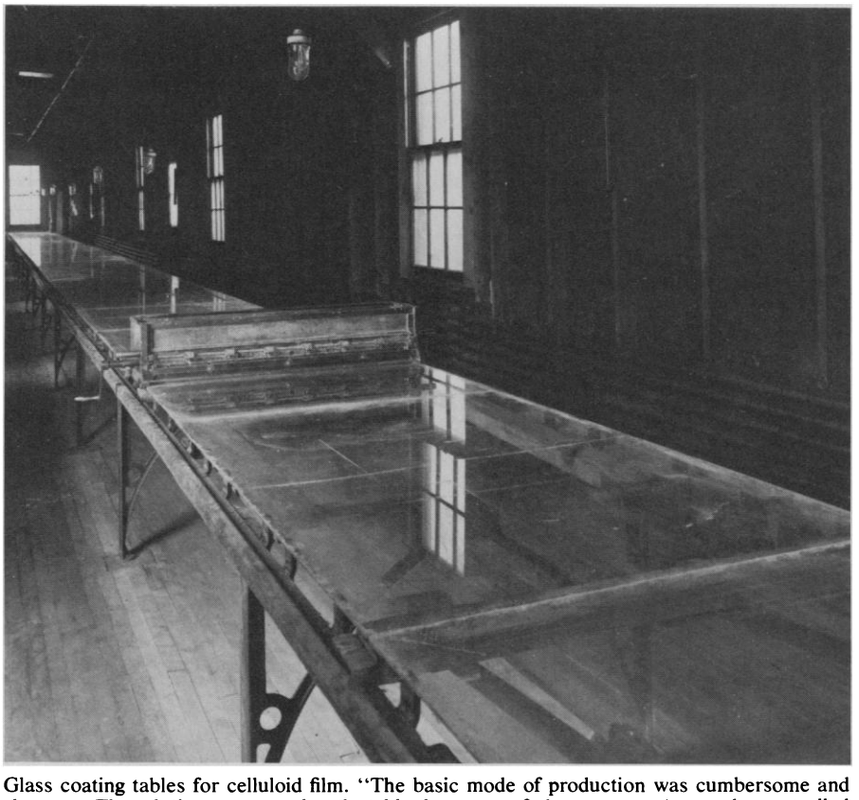
Jenkins points out that in his drive toward monopoly Eastman was only doing what all other entrepreneurs would have done, had they been as capable. Perfect competition had seldom existed for long in the photographic industry. Each of its five historic phases had begun with imperfect competition when those who had pioneered in introducing a decisively improved carrier base had the market virtually to themselves. Soon, however, there were imitators, and a period of perfect competion ensued during which the prices fell, eventually to levels below profitability. At this point competition was once again curbed by pools, price-fixing, mergers, and other oligopolistic practices.

That the American photographic industry should have risen to world leadership at a time when the Germans dominated the adjacent fields of fine chemicals and optics not only is a tribute to Yankee inventiveness in mass production and marketing but reflects as well the rising competence of American science and engineering. Quite independently of the Germans, Eastman, like Edison, perceived the advantage of in-house, ongoing product innovation. The Kodak Research Laboratory that he established in 1912 was merely the capstone of a research and development program he had begun in 1886 with the hiring of a college-trained chemist, Henry Reichenbach, to help in the development of celluloid film.

In approach and style Jenkins writes like a social scientist. His dispassionate analysis is presented in clear, pedestrian prose. He eschews the humanistic and literary dimension of history—the dramatic, the personal, the humorous, and the ethical. With a few exceptions the many illustrations and charts he provides are very useful. So too are his footnotes, but most unfortunately there is no bibliography.

Some might find fault with this book for being whiggish, an apology for the victors explaining why the American photographic industry rose to world leadership and how George Eastman triumphed within that industry. Jenkins

Women assembling Kodak cameras, circa 1889. [Reproduced in *Images and Enterprise*, courtesy of Eastman Kodak Company]



Glass coating tables for celluloid film. "The basic mode of production was cumbersome and slow. . . . The solution was spread on the tables by means of a hopper. . . . A spreader controlled [its] thickness . . . The character of the solution was critical, for if it was not sufficiently viscous it would run off the table, but if it was too viscous it would not spread evenly. The coating on the tables was then allowed to dry. [Next] the dried celluloid film was prepared for the emulsion coating [which] consisted of nitrocellulose dissolved in wood alcohol plus additional solvents such as acetate of amyl, fusel oil, and camphor. . . . After the emulsion had dried, the film was stripped from the table, cut, and spooled." The first celluloid film for public sale was produced in August 1889. "With the . . . film in production, a decade of fairly radical technological innovation by George Eastman, William Walker, and Henry Reichenbach came to a close." [Reproduced in *Images and Enterprise*, courtesy of Eastman Kodak Company]

tries sincerely to tell the story of the losers. But that is not easy. Their number is large and their records are seldom as complete and conveniently accessible as those of the winners. Whiggishness is the original sin of historians. Though they cannot escape it completely they can at least try their utmost to overcome it. Jenkins has done that and has produced a balanced, definitive study of lasting importance.

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Racial Attitudes

Towards the Elimination of Racism. PHYLLIS A. KATZ, Ed. Pergamon, New York, 1976. xiv, 450 pp. Cloth, $16.50; paper, $11.25. Pergamon General Psychology Series, vol. 54. Pergamon International Library.

Ethnic, racial, and religious cleavages and conflicts are salient features of the world of the 1970's. *Towards the Elimination of Racism* is a timely contribution to the hard thinking needed for realistic analysis of these phenomena, objective analysis of which has been especially difficult and often vulnerable to attack owing to dogmatism, distortions, and persistent misinformation.

Unlike many current books dealing with ethnic relations, this volume deliberately does not focus upon the effects of racist beliefs and practices upon racial minorities. Instead, the editor has selected contributions that critically review research pertaining to the modification of "white racism." The first of the three groups of chapters summarizes several of the major theoretical approaches used in explanations of interracial attitudes and behavior. The second reviews a substantial accumulation of social psychological research concerning change in individuals' racial attitudes and in intergroup behavior. The third deals with the modification of institutional racism, that is, of those collective or systemic arrangements that produce racial discrimination or perpetuate disadvantage. Most of the chapters attempt to identify the principles that seem to account for success or failure of efforts to change intergroup attitudes and behavior of white persons in the United States.

An evident advantage of the chosen orientation is that it favors causal analysis rather than noncommittal description, thereby posing important issues that cannot be hidden in a thicket of "interesting" facts. On the other hand, the emphasis upon purposive efforts to change racial orientations occasionally seems to produce a tone of advocacy that distracts attention from the scientific issues. A tension between activistic and analytic interests seems implied when the editor thinks it appropriate to remark that scientific studies are not an adequate substitute for direct efforts to change the social system.

Although the orientation of most of the chapters is toward psychological rather than sociological studies, the editor suggests that "political, economic and legal action" to restructure societal arrangements is the most promising approach for eliminating racism. Even so, the social psychological approach is regarded as essential for correct diagnosis and effective social action, especially in view of the gaps between what is intended by and what results from legislation and judicial decisions.

The work identifies two foci of controversy in behavioral and social science research on racial relations in the United States. The first results from differing appraisals of how much of what kind of change has occurred in recent decades; for example, has the situation of black people improved at all, and if so, how much and in what ways? The second set of intensive debates concerns whether recent attempts to modify interracial behavior at the individual level have been more successful or less successful than those directed to the organizational or institutional level.

A third and prior controversial question is not explicitly dealt with, although it is raised by the very title of the work: What is "racism"? It is perhaps fortunate that most of the contributors did not attempt to guide their analyses by the definitions offered in the initial chapters. Katz makes racism synonymous with any categorical inequality, that is, "the unequal treatment of individuals because of their membership in a particular group." This remarkably broad characterization occurs in a context of frequent interchanges of terms—"racist practices," "discrimination," "inequality," and "practices and beliefs of racism." Even if the reader is able to sort out this collection of related but surely not identical concepts, she or he will hardly be helped by encountering in the very next chapter Chesler's characterization of racism as "whatever acts or institutional procedures help create or perpetuate sets of advantages or privileges for whites and exclusions or deprivations for minority groups." By these definitions racism is being practiced whenever white parents aid their children to get a good education, assist them in locating jobs, or allow them to inherit property. No doubt unequal advantages are involved in these practices, but how is clarity served by lumping them together with gross and explicit racial exclusion and denials of opportunity?

Other examples of conceptual problems are scattered through the text. To take only one other case, the editor at one point wonders whether during recent years interracial "attitudes and *behavior* [emphasis added] have actually changed, or whether what we are witnessing is simply an increase in their variability." But is not an increase in variability an actual change? And in any event I fail to understand the incertitude concerning overt behavior, for surely—though the macrochanges do not apply in every local or individual instance—we have abundant objective evidence of large changes in voting, office-holding, occupations, income, education, housing, and social participation.

Having thus found fault with central definitions, I must hasten to commend the work as a whole. The incisive analysis by Chesler of types of ideological elements in theories of racism is a gem of relevance and clarity. But commendations would become invidious quickly, for nearly every chapter gives a review of research from which is extracted a residue of well-attested findings and hypotheses. Some examples may suggest the richness.

1) Under a remarkably diverse range of other circumstances, the sheer fact of negative intergroup interdependence (for example, competition) is sufficient to produce collective prejudice.

2) Given an ingroup-outgroup distinction, direct competition and rivalry generate hostility and negative attitudes and behavior toward the outgroup, which subsequently become normative.

3) Given ingroup support of prejudice and discrimination, the negative behaviors are rendered especially likely by segregation, by socialization that reinforces them, by high levels of frustration, by