Textile Education in Coloration and Textile Wet Processing Technology

John Richard Aspland, Clemson University

Introduction

Born in Leeds, England, to parents in the elementary school teaching profession, it seemed quite natural that Aspland would follow teaching as his primary profession of choice, albeit at the university level. Fate decreed rather differently.

Basic Academic Training

Aspland was awarded a B.Sc. (Hons., Colour Chemistry) 1958 and M.Sc. (Dyeing) 1960, from the University of Leeds, England (Dissertation: "A Study of the Influence of Chemical Constitution on the Affinity for Cellulose of Non-ionic Dyes"); the Textile Research Institute Fellowship, Princeton, NJ, USA, 1960-1961; and a Ph.D. (Polymer and Fiber Science) 1964, from the University of Manchester, England (Dissertation: "Some Effects of Ionization on Nucleophilic Substitution of the Second Order").

Earlier Teaching Positions

Aspland was Assistant Professor of Polymer and Fiber Science, 1961-1964, and Associate Professor 1964-1966, at the University of Manchester Institute of Science and Technology, England.

Critical Decisions

In 1961, Aspland married Frieda Rosa Jackwert and a son, Antony John, was born to them in 1962. In 1966, the Asplands emmigrated to Charlotte, NC, USA, where they lived for nearly twenty years. Charlotte has similar annual rainfall to Manchester, UK, but the rain falls on only about 35 days. In Manchester, this seems like 350 days, but the temperature can occasionally reach 70 °F.

The Next Sixteen Years

These years were spent in industrial positions, first, as Applications Research Manager at one of the world's largest sulfur dye manufacturers (then called Sodyeco, a division of Martin Marietta (1966-1973). It was later bought by Sandoz.

In 1973, Aspland joined Reeves Brothers Inc. as Textile Research Manager. Associated responsibilities were for the Textile Research, Development, and Service activity for the Apparel-Textile and Consumer Products Division of Reeves Brothers Inc. comprising 14 plants and US$200 million sales. Responsibility was for up to 15 persons (1973-1982) at Reeves Corporate Analytical Services Labs (1976-1982) and Physical Testing Labs (1978-1982).

Back to College

In 1982, Aspland was invited to join the faculty of the School of Textiles at Clemson University after a senior (textile wet processing) professor became ill and retired. Aspland's family moved, first to Greenville and later to Clemson, SC, USA. After 24 years, Aspland retired as Emeritus Professor of Materials Science and Engineering. The change of emphasis in the activities and

faculty of the former School of Textiles gave Aspland the ability to play on a much broader field of polymers than that of textile manufacture alone.

Forty Years of Teaching
The previous forty plus years led Aspland into a wide variety of part-time positions including:
• Visiting Professor, Colour Chemistry Department, Leeds University, England, Sabbatical Leave (1999)
• Visiting Researcher, Ciba-Geigy, Basel, Switzerland, Sabbatical Leave (1991-1992)
• Professor of Chemical Technology, Central Piedmont Community College, Charlotte, NC, USA (1968-1981)
• Chairman of the Advisory Committee on Chemical Technology, Central Piedmont Community College, Charlotte, NC, USA (1977-1978)
• Advisory Committee Member, North Carolina Vocational Textile School, Belmont, NC, USA (1974-1977)
• Professor of Dye Chemistry at Manchester Technical College (later Manchester Municipal University) (1963-1966)
• Examiner for the Society of Dyers and Colourists (1963-1966).

Time Passes
In 1999, Aspland received the prestigious AATCC Chapin Award. For many years, Aspland and his Clemson students contributed articles to the proceedings of the AATCC at their Annual Conference (ICE). In 2004, Aspland and Pramode Shanbhag received the AATCC J. William Weaver Paper of the Year Award for a paper entitled “Comparison of Color Equations for: CMC (2:1) and CIE: DE 2004.”

Clemson University Professional Development Textile Seminars
For decades, these programs ran on a wide variety of textile subjects. Many of them dealt with dyeing, finishing, and coloration topics as well as color measurement and match prediction. Aspland was both an organizer and presenter of papers on too many of these professional development conferences to list.

Early Manufacturing Experience
Activities on which Aspland worked from 1966-1982 before joining the Clemson faculty included flame retardant fabrics development and fabric processing techniques; color measurement, shade sorting, and color match prediction; setting up plant laboratories and a jig dyehouse; water repellency and rainwear fabrics; military fabrics and their numerical color tolerances; industrial lecturing and consulting on behalf of Reeves Brothers and Sodyeco, internal and external consulting (recipients included most of the major textile dyeing and finishing companies in the USA); expert technical witness in arbitration and lawsuits; new dyeing techniques, new dye oxidants novel textile auxiliaries, including alternative oxidants for sulfur dyes to eliminate sodium bichromate; heat transfer printing; continuous and batch wet-processing of knit and woven goods; running plant trials in preparation, dyeing, and finishing (for Reeves Brothers, Sodyeco, and for other major textile companies); pilot plant production of dyes and intermediates; dye structure analysis; in-house production of textile auxiliary products; and technical education of textile finishing plant personnel.

Changes in the Wind

The progressive loss of much of the domestic textile manufacturing industry in the past several decades has led to much soul searching in academic departments and within professional textile associations, such as AATCC and the SDC in the UK. The concern was how best to respond to their constituents whose activities are still thriving but are primarily involved with obtaining the textile goods they need from manufacturers outside their traditional North American and European sources. This led progressively to a much greater emphasis on the sales and marketing skills necessary to deal with unfamiliar Asian manufacturers, primarily in China and India.

This led directly to problems of communication in foreign languages (although it is true there are many Asians with textile interests in North American academic engineering locations). However, at least equally important, it has become critical that those requiring textile products from Asia should have the ability to specify, as precisely as possible, just what technical and financial requirements the desired goods should meet, and to have the assurance that the repeatability of their production quality can be relied on. In either case, the answer is improvement in international communications (languages), and an intimate knowledge of technological textile properties and their detailed relationships to their product performance.

An Early Response to the Pressure

AATCC decided to form a committee to call for a collection of 12 papers on dyeing and coloration—related topics which would address the basic principles of textile colors and coloration methods. These papers were first published individually, but then reprinted and collated in 1981 in one volume as the *AATCC Dyeing Primer* (Ref. 1). Of these 12 short papers on the Fundamentals of Dyeing, Aspland contributed two. It was probably this experience that led AATCC's editorial director at the time, the late Jack Kissiah, to ask Aspland if he would be willing to write a series of chapters which could appear on a monthly basis in *Textile Chemist and Colorist*. In all, 24 such chapters appeared between October 1991 and November 1993. These were integrated into one volume in 1997 as *Textile Dyeing and Coloration* (ISBN 0-9613350-1-7) published by AATCC (Ref. 2).

Subsequent private comments on the book (by a few professors) pointed out to the author that it was not written at an appropriately high level of academic difficulty and should have paralleled several excellent prior publications by the Society of Dyers and Colourists. This was in contrast to the opinions of several practicing textile dyeing technologists, who found the content more difficult than they would have liked. Aspland was recently told, by those more computer savvy than he, that it is now possible to highlight scientific papers to produce educational texts that assists readers (with notations indicating the scientific level of individual sections). This enables the texts to be read at whatever level the reader chooses. There should be no doubt that the AATCC professionals at Research Triangle Park (to say nothing of using the facilities there) are working hard on making it possible to publish readily accessible basic textile literature, to host Asian visitors, to hold seminars in Asian locations, and to make communications within the worldwide textile industry as simple and meaningful as possible while smoothing out any other difficulties as they arise.

As a “Clemson Tiger,” Aspland admires the efforts of the College of Textiles at North Carolina State University (NCSU) for their co-operative work with AATCC. Indeed, Aspland envies the good fortune that ATTCC and NCSU are so conveniently placed geographically.

It is Aspland’s hope that the *AATCC Technical Manual* (Ref. 3) will play a considerable part of any NCSU textile curriculum, for the contents of this technical manual, while reliable and scientifically accurate, are kept up to date, and are remarkably free from the arcane physical chemistry which seems to be anathema for the textile mill operative, but which has been a hide-out for many an academic researcher. At the time of writing this paper, the author’s attention was drawn to a *Wall Street Journal* article (Dec. 21, 2013) on the 2012 Ph.D. dissertation of Brian Hamilton, from NCSU’s College of Textiles, on the global textile industry. Way to go!! This article points out that, for several Chinese and Indian smaller textile businesses, there are opportunities for energy savings and tax breaks in the US South.

Additional Book Chapters and Comments

One book chapter to consider is J. R. Aspland’s “Colorants: Dyes,” Chapter 11 (Ref. 4). This chapter is important particularly when read along with Peter Lewis’s “Colorants: Organic and Inorganic Pigments,” Chapter 10, (Ref. 4). Between them they spell out the principle difference between “dyes” and “pigments.” Despite historical colorant names, pigments are invariably fiber insoluble particles, which is not true of dyes that are invariably soluble during the color application process. Does this make indigo a dye, or a pigment?

Another book chapter is, J. R. Aspland’s “Instrumental Shade Sorting Past, Present and Future: “Color Technology in the Textile Industry” (Ref. 6). Editor Celiciz presented a series of papers by J. R. Aspland and J. P. Jarvis, et.al, indicating that they felt they had shade sorting software superior in performance to that used at the time (Refs. 7-11). In these papers, a novel numerical shade sorting technique called CCC (Clemson Color Clustering) compared very advantageously with the standard 555 method. The CCC software was made generally available, but under existing economic restraints, the novelty could not be capitalized on by the textile industry. This was a disappointment at the time, but not entirely unexpected. Unfortunately, many academically and technically sound and novel processes could not be brought to book against entrenched commercial opposition.

Good Idea? Unexpected Snag!

One example of this would be the Dykolite dyes known already in the 1971 *Colour Index* as a mixture of sodium S-arylthiosulfates (Ref. 12) plus a few sodium S-alkyl thiosulfates. They are no longer used because of an unexpected drawback. The dye chemists at Sodyeco, where Aspland was then in charge of the Dye Application Laboratory, were unable to produce any bright reds at all with satisfactory lightfastness. This was insuperable when compared with the brilliant reds of fiber reactive dyes.

Fluorescence Measurement

Another more recent example of a good idea that did not meet the financial criteria was the work carried out during a period when a bispectral fluorescence spectrometer, the Labsphere BFC, lent to She-Lynn for measuring phenomena related to optical brighteners and fluorescent dyes and dyeing, was put to use by Clemson graduate students and a post doc. One or two such specialized

instruments have been available for sometime in a few places, e.g., the National Physics Laboratory at Teddington, UK, and the National Research Council of Canada in Ottawa, Canada. Unfortunately, after a short period of interesting research, the present instrument was withdrawn from the marketplace for economic reasons. This caused a potentially useful program to be withdrawn.

Current Activities

At this time (2014), Aspland is still involved in consulting and periodic funded research projects using the physical testing and analytical facilities of the MS&E School at Clemson University, but retirement has turned down the heat of his basic academic research. However, Aspland has been involved with two written projects along with a former M.S. graduate student of Clemson (recent AATCC Harold C. Chapin Award winner Ann Laidlaw), to produce the *AATCC Color Guidebook* (2011), and the upcoming *Primer of Textile Colorants and Coloration*, which is currently in the hands of AATCC personnel working on means of making it valuable to readers exposed to a wide range of technical interest levels. This is an exciting experiment, but could take several months to bring to completion.

Clemson University (C) and Professional Honors (P) and Awards

- Award for Faculty Excellence, Clemson University Board of Trustees, 2000 (C)
- AATCC Harold C. Chapin Award for Service, 1999 (P); (first-ever recipient from Clemson University since its inception in 1959)
- J. J. Lyons Distinguished Teacher Award 1995-1996 (C)
- Clemson College of Commerce and Industry Teacher of the Year Award 1993-1994 (C)
- Elected Fellow of the Textile Institute (C. Text. F.T.I.) 1988 (P)
- Phi Psi Teacher of the Year Award, 1986 and 1990 (C)
- Elected Fellow of the SDC, (C. Col.F.S.D.C.) 1968 (P)

Miscellaneous

Aspland has consulted for and/or trained personnel of about 30 different textile-related companies. He has made presentations and attended conferences in 20 different countries. He holds several US patents, but his favorite is US 3,716,325 (Feb. 13, 1973), which extends work he undertook for Sodyeco in the elimination of sodium bichromate from the standard method of oxidizing reduced sulfur dyes. The present oxidant is vanadate catalyzed sodium bromate.

Summary

Though his extensive academic research has been satisfying, he is most proud of his forty year working association with AATCC and of his contribution, through them, to textile education in the United States and internationally.

References

1. *Dyeing Primer*, AATCC, Research Triangle Park, NC, USA, 1981, 12 papers, pp4–38, reprinted from *Textile Chemist and Colorist*.
2. Aspland, J. R., *Textile Dyeing and Coloration*, AATCC, Research Triangle Park, NC, USA, 1997, pp1–401.
3. *AATCC Technical Manual*, AATCC, Research Triangle Park NC, USA (published annually).
4. Aspland, J. R., "Colorants: Dyes," Chapter 11 in *Color for Art, Science and Technology*, edited by K. Nassau, Elsevier, New York, NY, USA, 1998.
5. Lewis, Peter, "Colorants: Organic and Inorganic Pigments," Chapter 10 in *Color for Art, Science and Technology*, edited by K. Nassau, Elsevier, New York, NY, USA, 1998.
6. Aspland, J. R. "Instrumental Sorting, Past, Present and Future" in *Color Technology in the Textile Industry*, edited by G. Celikiz, 2nd Ed., AATCC, Research Triangle Park, NC, USA, 1997.
7. Aspland, J. R. and J. P. Jarvis, "A Review and Assessment of Numerical Shade Sorting Methods," *Journal of the Society of Dyers and Colourists*, Vol. 106, October 1990.
8. Aspland, J. R. and J. P. Jarvis, "Color Consistency and Shade Shorting," *Textile Chemist and Colorist*, Vol. 22, No. 10, 1990.
9. Aspland, J. R. and J. P. Jarvis, "A Comparison of Four Approaches to Shade Sorting; Technical Note," *Textile Chemist and Colorist*, Vol. 19, No. 9, 1987.
10. Aspland, J. R. and J. P. Jarvis, "An Improved Method for Numerical Shade Sorting," *Textile Chemist and Colorist*, Vol. 18, No. 10, 1986.
11. Aspland, J. R. and J. P. Jarvis, "Color Tolerances, Specifications and Shade Sorting," *Textile Chemist and Colorist*, Vol. 18, No. 6, 1986.
12. Weston, C. D., et al., "Dykolite Dyestuffs for Cellulosic Fibers," *Textile Chemist and Colorist*, Vol. 1, No. 22, 1969, pp462–477.
13. Aspland, J. R. and Ann Laidlaw, *A Color Guidebook: Best Practices for Color Control in the Textile Supply Chain*, AATCC, Research Triangle Park, NC, USA, 2011, pp4–26.