

## Geosynthetics in perspective: 1988–1992

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*This is the second in a series of four articles by four different authors celebrating GFR's 20th Anniversary. The four articles will look back at the last 20 years of development in the geosynthetics industry. Each author will provide his perspective on a five-year period of geosynthetics history. Dr. J.P. Giroud wrote the first installment in this series, on the years 1983–1987, published in the June/July issue of GFR.*

—Ed.

Within the United States, the period 1988–1992 brought significant organizational advancement and saw a major new market unfold. The second of the “odd year” national geosynthetics conferences sponsored by the Industrial Fabrics Association International (IFAI) was held in San Diego, Calif. This repeat success at sponsoring a national conference led to an even greater geosynthetics conference success for IFAI at Atlanta in 1991. These conferences provided the first opportunities for the broader geosynthetics community, both manufacturer and user, to meet, display their wares, and discuss applications and benefits. The North American Geosynthetics Society (NAGS) was already well established and instrumental in supporting IFAI’s efforts through the organization of the technical portion of the conferences. In 1989, NAGS kicked off its Award of Excellence program, providing grants for support research to the best papers in the conference. Also emerging during this period was the organization of the educate-the-educator program in which 25 geotechnical professors were brought to Auburn University and provided with training and supporting materials for teaching geosynthetics in their respective curricula. IFAI again led this effort with co-sponsorship from the National Science Foundation and NAGS as well as other industry representatives. Significant credit for the success of this program should be attributed to David Elton of Auburn University.

Educationally, Robert Koerner and I prepared a simple design primer on geosynthetics for the use of IFAI members. In current parlance, this would no doubt be titled “The Idiot’s Guide to Geosynthetics,” but it represented a starting point in the education of young engineers. Not wanting to disappoint the seasoned designer, Bob also produced the second edition of his text *Designing with Geosynthetics*. Now in its fourth edition, this book remains the standard for the industry.

The Federal Highway Administration (FHWA) continued its efforts to train the road builders of the United States in related geosynthetic applications by sponsoring both courses and research. Using the FHWA *Geosynthetic Design and Construction Guidelines* manual authored by Barry Christopher and Bob Holtz, FHWA had J.P. Giroud travel to most of the states teaching the basics of geosynthetics in road building. Late in this period, after J.P. had acquired million-mile frequent flyer status, this course was taught by Barry Christopher, Bob Holtz, and Ryan Berg. Barry also led the FHWA effort to research and publish a major report on geosynthetic-reinforced soil structures having vertical or sloped faces. Major fabric-reinforced walls were constructed in Chicago by Barry and in Seattle designed by a rising young geosynthetics star named Tony Allen as part of interstate highway construction. One cannot talk about the FHWA effort without giving credit to Jerry DiMaggio of the FHWA. He has been a driving force behind this effort since the early '80s

and remains an important part of it today.

This period began with dramatic conventional geosynthetic applications, including such projects as the dredged sediment-contained disposal facility constructed at Wilmington Harbor on the mud of the Delaware River using high-strength geotextiles; this period also saw the increased use of geogrid and geotextile-reinforced retaining walls. Retaining walls moved from federal highway projects to the backyards of local developments. Rob Swan completed his masters degree for Bob Koerner and continues to provide valuable research and application laboratory work related to wide-width and pullout strengths of geosynthetic reinforcements. It has been rumored that Rob weighed only 90 pounds before he began hoisting wide-width grips and being nurtured by Bob's wife Paula.

However, this period was dominated by the growth of environmental landfill and site closure-related applications generated by the enactment of provisions of the Federal Resource and Recovery Act (RCRA). The author had the pleasure of traveling throughout the United States with Robert Koerner and David Daniel teaching landfill and site closure-related courses for the U.S. Environmental Protection Agency (EPA) in all ten EPA regions. These courses were taught in 1988, 1990 and 1992 with averaged site attendance exceeding 300! Dave began this course series as "Mr. Compacted Clay Liner" and kept us spellbound with his emotional description of the Gouy-Chapman Theory—not a dry eye in the house. Dave ended this time period as the most influential researcher on geosynthetic clay liners.

During this same period, J.P. Giroud was working with the EPA to develop his landmark liner leakage analysis technique that remains the cornerstone for contemporary liner system evaluations. From nowhere, the EPA-driven applications began to dominate geosynthetic applications and overshadow more traditional applications such as potable water containment and heap leach mining pads. As with the FHWA effort, much of the success of the EPA program was the result of the efforts of a single focused government professional. At the EPA, this charge was aptly handled by Robert Landreth.

The 4th International Conference on Geotextile, Geomembranes and Related Products took place in The Hague in 1990. As the name of the conference implies, the industry was moving from a focus on geotextiles to additional products, including geogrids, geonets and geosynthetic clay liners. This "What are we?" confusion would continue until 1999 when the 6th international conference became the more appropriately titled International Conference on Geosynthetics. Both Koerner and Giroud successfully presented the emerging geosynthetic environmental applications at The Hague and gave much of the world their first view of our new geosynthetic-dependent landfill technology.

The emergence of drainage composite and geosynthetic clay liners during this period was interesting to watch. Drainage composites quickly became an attractive alternative to granular drainage layers and the preferred alternative for leakage-detection systems. Geosynthetic clay liners, however, would not displace compacted clay liners during this period. Their use was initially limited to composite barriers for primary liner



*In November 1988, GFR covered two important issues for this period: geosynthetic road applications and the progress of RCRA Subtitle D.*

systems in double-lined landfills and supplemental sealing around pipe penetrations. Several more years and product improvement would be required before they became accepted as an equivalent to a compacted clay liner.

Standardization as provided by ASTM International helped stimulate the growth of the industry during this period. The work of the ASTM committee over the preceding decade came to fruition during this period under the leadership of chair Barry Christopher and later (in 1989) David Suits (who is also the current chair). A number of test standards reached the engineering community through publication with the geotechnical standards and a separate compilation of geosynthetic standards.

By the end of this period, J.P. Giroud's *Geosynthetics Bibliography* listed over 10,000 references on publications related to geosynthetics. Not a decade earlier, researchers had few prior works to include within the references of their papers. For practicing civil engineers, the growth of the industry, in terms of both knowledge and products, was simply amazing.

This period also saw the loss to the industry of two individuals who played key roles during its early years: Joe Fluet and Bob Carroll, who were forced to retire exceptionally young for medical reasons and whose absence is still felt. Fortunately, a new generation of geosynthetic-savvy engineers was emerging during this period, including Rick Thiel, Deron Austin, and Aigen Zhao, and a decade of unparalleled prosperity was just beginning.

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