

# THE EVOLVING GENRE OF ELECTRONIC THESES AND DISSERTATIONS

for the 1999 HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCES

presented by

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*[Blue](#) text indicates a link.*

## ABSTRACT

Electronic theses and dissertations (ETDs) are a unique genre that is emerging in part as a result of the work to build [the Networked Digital Library of Theses and Dissertations](#) (NDLTD). Virginia Tech began requiring ETDs January 1, 1997 and has since received over 1450. Quality has already improved and what has been learned is more broadly shared now due to the national and international interest

in ETDs. This flexible genre will enhance digital libraries in part because over half contain color images or other multimedia, including audio, video, or VRML files. Due to free access, many have been downloaded thousands of times. As the NDLTD expands, tens of thousands of these will be created each year all over the globe and in the near future the NDLTD will broadly support multilingual and federated searching. This paper presents findings at Virginia Tech as a case study of shifting book-length

works to electronic documents for the global digital library.

## INTRODUCTION

Since the expansion of the Internet, there have been dramatic changes in the whole enterprise of research and education. Now helping drive further change, are the key documents of graduate studies: theses, dissertations, project reports, and similar works. These documents have been largely the concern of graduate students and faculty, the research community, the libraries that handle them, and UMI, through its Dissertation Abstracts product. As libraries rethink their roles, guided by historical insights and the fundamental mission of information sharing, they play a leading role in making theses and dissertations a more effective vehicle for communicating university research results [[GUED](#)].

## HISTORY OF DISSERTATIONS

Historically, graduate education in the U.S. was launched in large part as a result of Americans visiting Germany, becoming involved in graduate research there, and bringing back the notion of

reporting research results. Yale University awarded one of the earliest doctorates in 1861 for a six-page handwritten dissertation. Since then the number of dissertations awarded each year in the U.S. is over 50,000. The yearly worldwide production of theses and dissertations easily exceeds 100,000.

UMI has over 1 million full text black-and-white dissertations available from its microfilm vault and accessible through Dissertation Abstracts. For about \$30 each, researchers can obtain unbound copies within four days. Nevertheless, very few dissertations are requested, and fewer still have been ordered enough times (>7) to warrant a royalty payment to the author.

Through the Online Computer Library Center, OCLC, library catalog records for more than two million theses and dissertations are available. Many, however, have incomplete records and there are problems accessing these works.

From library circulation records we know that theses and dissertations infrequently checked out. The combined average circulation for Virginia Tech theses (submitted 1990 - 1994) was 2.24 times per copy per year, and dissertations submitted during the same period had a combined average circulation per copy of 3.2 times a year.

In this genre the amount of information sharing that takes place has been far short of what it could be. Through the Networked Digital Library of Theses and Dissertations (NDLTD), we hope to help students understand enough about electronic document preparation to create and submit their works to a digital library, and to make use of digital libraries of theses and dissertations to extend their own research.

## **HISTORY OF ETDs**

As electronic publishing technologies develop, a number of parties have been considering the potential of this genre. In 1987, UMI hosted an ETD workshop, and in 1992 and 1994 representatives from at least ten universities held meetings. In 1996, the Southeastern Universities Research Association (SURA) provided \$90,000 to Virginia Tech to explore ETDs as SGML documents and the project staff developed a still-evolving Document Type Definition called ETD-ML. To extend ETDs to the national level, in 1997 Virginia Tech received funding from the U.S. Department of Education's Fund for the Improvement of Post-Secondary Education (FIPSE; \$207,000). As international members joined our effort, we changed the name from the National... to the Networked Digital

Library of Theses and Dissertations. Since then, the Council of Graduate Schools (CGS) and the Coalition for Networked Information (CNI) also support these efforts. Representatives from these and other organizations are part of a steering committee that guides the ETD Project during its grant funded phase.

As technology developed that helped make ETDs feasible, UMI adjusted its policies, for example working with Virginia Tech to receive email notification when a new ETD was available for UMI to download and microfilm. UMI has also developed routines for converting paper theses and dissertations to Acrobat's Portable Document Format (PDF). Since the beginning of 1997, UMI has been scanning all new works received in paper and creating PDF files (essentially a wrapper around the black-and-white page images). While these help to make more doctoral works available electronically, they cannot completely convey what is expressed in the original works. Nevertheless, UMI's service is important and valuable, and marks a significant step toward a digital library of dissertations.

## INITIATIVES

Another type of ETD is one created and shared by the author electronically and of particular importance are the students who write the works and create ETDs that are more expressive than words on paper. This type of ETD can include multimedia, i.e., hypermedia, and is scalable as well as much more compact than the image format that results from scanning pages. Many recent ETDs are partnerships between technology and scholarship. For example, adding a video clip brings action and sound to the reader in a way that words on paper cannot. [[MANG](#); see [ORAL](#)]

## STUDENT INTEREST

A graduate student at the University of Virginia, Matt Kirschenbaum, hosts a Web site of ETDs that are more effective than usual in expressing their research results [[KIRS98](#)]. His site provides evidence that many students are personally interested in using new publishing approaches. They are pioneers helping to define the emerging ETD genre [[KIRS96](#)].

Since multimedia content can require a large storage space, some universities are considering

having ETDs submitted on CD-ROMs [[MANG](#)]. However, submitting a CD-ROM requires handling and storage of the media that increases expenses for libraries relative to other approaches such as network submission.

[VT ETD homepage](#)

## VT ETD INITIATIVE

While there are several ETD initiatives, the most extensive effort is at Virginia Tech that has over 1400 original works online. A web site, designed and maintained by the library, focuses on ETDs as an information resource [[SCP](#)]. Additional information is available that focuses on training and the national and international efforts to extend ETDs to the NDLTD.

[ETD/NDLTD homepage](#)

Between these two web sites, Virginia Tech's ETD-related information on the Web is organized into [five areas](#).

Beyond the FIPSE grant, the Virginia Tech Graduate School, the Library, and the Computing Center are committed for the long term to making ETDs the

norm. Currently 45 other academic institutions around the world are also committed to ETDs. This pioneering work and the successful collaboration with other academic institutions will help this genre develop and more than likely map policies and procedures to other electronic genres.

## NDLTD

The Networked Digital Library of Theses and Dissertations calls for a sustainable, worldwide, collaborative, educational initiative of universities committed to encouraging students to prepare electronic documents and to use digital libraries. We believe that students often learn best by doing, so this competency-oriented initiative should ensure that the next generation of scholars is better prepared for the Information Age.

While global knowledge sharing is important in addition to increasing collaboration among researchers [[FOX97b](#)], the goals of the NDLTD are sometimes at odds with the goals of students, faculty, and other educational and commercial institutions. Therefore, Virginia Tech developed an approval form that is completed and signed by students/authors and their advisory committee

members. On this form students indicate the type of access their ETDs should have. We hope that students and faculty will, in time, allow broad access, once they are assured that there will be no ill effects from releasing their ETDs for worldwide use.

## Table 1

Table 1 illustrates the distribution for each of the various access conditions. Giving authors control over the level of access to their works is one of the key benefits and advantages of a digital library [[GLAD](#)]. The percentage of authors giving unrestricted access to their ETDs rose 6.5% from 1997 to 1998, while the number of ETDs restricted to university-only access dropped 8% and the number of inaccessible VT ETDs rose only marginally (.8%). [This is a change from the paper published in the proceedings which used ETDs approved only through early September 1998.] There are significantly more inaccessible ETDs than their paper counterparts that were withheld from the public prior to 1996 (largely due to pending patent applications).

This genre, perhaps in contrast to other digital works, has authors limiting access out of fear. VT ETD authors complete a survey at the end of the

submission process and this revealed that 14% restricted access based on the advice of publishers while 40% restricted it based on the advice of their faculty. With publishers unsure how ETDs will effect the sales of their journals, many faculty want to protect these future academics from succumbing to the publish or parrish phenomenon in the Information Age through possible harm done to their publishing potential in traditional formats. Some publishers are beginning to exert somewhat less control by allowing students to release access to their ETDs after their articles have been published in traditional academic journals [ACM]. Universities are, of course, simultaneously appalled at the idea of commercial entities telling them what they can and cannot do with the research conducted within the academy.

Another key issue for the NDLTD is preservation and how to ensure that ETDs are archived and accessible in the future. This will require a multi-pronged approach: (1) copying to new media as it becomes available, (2) keeping multiple active copies in various locations, and (3) migrating file formats as needed. The Library, the University Archive, and Information Systems (computing), are committed to preserving ETDs for posterity.

## Table 2

Table 2 shows that out of our 1454 ETDs, there are nearly 500 accompanying sound and image files. This, of course, does not include image formats that are embedded within the PDF files. An analysis planned for later this year will determine how many ETDs have some kind of multimedia content and the average number of each media type per ETD.

Since 1987 the use of standards has been an essential ingredient in the sustained evolution of this genre of online scholarship. The ease of using a common document format such as PDF has advantages for author preparation and for information sharing. Its benefits include capturing a fully rendered version of the work to be archived so that the author's intended look of the document is retained for online display and, when possible, for printouts. SGML affords further advantages, including context-dependent searching. Multimedia standards such as JPEG for images, MPEG for video, and VRML for virtual reality files, can be archived, of course. However, use of proprietary formats provides few guarantees.

Without doubt, migrating to future file formats will be less of a problem if open standards are used. Table 2 also illustrates the formats that Virginia Tech encourages (though, does not require) authors to use and what media authors have incorporated in their ETDs. About 5.6% of all files comprising ETDs

are separate image files. .3% are separate sound files and .8% are movies. The 1.5% in the “other” category is one ETD with macromedia/director files.

Table 3

### VT COLLECTION

Table 3 shows how many students submitted ETDs each year. The library began accessioning ETDs in 1995, including working with students who had completed their traditional works a few years earlier but who had retained them on diskettes. In some cases we asked students to make their theses and dissertations available electronically and some students asked the ETD team to consider adding their works to the collection. Graduate students at other institutions have also contacted us about storing their works.

In 1996 when we publicized that students could choose to submit electronic theses and dissertations, the library offered some incentive by waiving the binding fee (renamed “archiving” fee) for students who would submit PDF versions instead of paper. As of January 1, 1997, Virginia Tech has required that all graduate students submit their theses and dissertations electronically via the Internet. While many deplore mandates or

requirements in academic settings, it is clear that such an action was much more effective than voluntary submissions.

Table 4

### STATISTICS

Table 4 shows that there has been tremendous growth in ETDs downloaded each year from the libraries’ web site. Clearly, the number of ETDs accessed far exceeds the number of theses and dissertations circulated from the library’s traditional collection and the number of copies requested from UMI.

Table 5

Tables 5-6 show the significant number of accesses from U.S. and international sites. Table 5 illustrates domestic domains accessing VT ETDs. While no one would deny that ETDs were initially a curiosity, the continued increase in accesses, demonstrates longterm interest in this genre. Access by educational institutions remains high and it is understandable that non-profit organizations would be not be as interested in these works. Perhaps the



substantial number of accesses coming from commercial enterprises represents industrial research labs; and, while it is possible that such accesses are largely by people taking classes part-time who use a computer in their work place, it is likely that many are involved in corporate research and development. Access from federal government domains continued at the same dramatic rate of increase.

Table 6

There were vast increases in the number of accesses from one year to the next. Table 6 demonstrates international interest in ETDs and not just from English-speaking countries. Asian countries have four of the top twelve hits in 1998 with Japan moving from sixteenth in 1996 to number eight in 1998. The United Kingdom and Europe dominate ETD accesses with seven of the top twelve countries. The UK continues to out rank every other country in the number of ETDs accessed while Germany moved from sixth in 1996 to third in 1997 and second in 1998. These accesses, of course, also demonstrate countries where Internet access is the greatest, but they also illustrate surprising declines in accesses from some countries.

Table 7

Table 7 shows the most popular works during 1996 according to the number of times the PDF files (i.e., full works) were accessed. We had 103 ETDs submitted voluntarily by the end of the year. There were two from Education, two from Sociology, and three from Engineering; three doctoral dissertations and four masters' theses.

Table 8

Table 8 illustrates 1997 accesses to the eight most popular ETDs (in terms of the number of times each was accessed) from among the 506 ETDs available by the end of that year. Among these, five out of eight were from the 1996 voluntary submissions. There was one from Physics, two from Computer Science, and five from Engineering; six dissertations and two theses.

An interesting shift in 1997 (with the first mandatory submissions) is this focus on scientific and engineering ETDs. Whereas education was a popular topic among the 1996 voluntary submissions, none had that theme in the most popular set for 1997. Virginia Tech is known for science and engineering, and has a large number of degrees awarded in these areas. Another explanation is possibly, the importance of sharing



the kind of content found in these ETDs in a timely manner.

Table 9

Table 9 shows some data about the ten most accessed ETDs in 1998. While most ETDs are about one or two megabytes in size, the most popular ones are somewhat larger. In particular, these popular works contain illustrations, many in color. They give a great deal of detail, have long bibliographies, and have extensive literature reviews, typical of this genre. This year seven are dissertations and three are theses; two from the volunteer period, and seven from the first year ETDs were required, 1997. It is not surprising that length of time an ETD has been available online effects the number of accesses within any one year, but perhaps not over a longer period of time. Of course, it is too early to make firm conclusions. Note that in 1998, nine out of ten are from the sciences (computer science, physics, and engineering), but one is from interior design (see [Oral](#) in case study following).

Most agree that universities will increasingly commit their resources to supporting electronic theses and dissertations, that more students will contribute their works to digital libraries that can be linked through federated searching of the NDLTD,

that the works supplied will have richer multimedia and hypertext content, and that they will probably become larger files. The number of accesses to the NDLTD will continue to rise and will increasingly come from a more varied segment of scholars worldwide.

Table 10

#### CASE STUDIES

These quantitative measures deal with the variety of content and representations, but a look inside several VT ETDs may reveal trends in this genre of online scholarship. During presentations and when discussing the ETD Project with other universities, we developed a sampling of ETDs that illustrate the changes in graduate students works due, at least in part, to the online versus the paper submission. Table 10 shows ETDs that include graphics, many in color, that probably would have been too expensive to include in a paper document. They also include Web links to both internal and external sites. These titles also suggest the range of topics that can be advantageous for this online genre.

The second column indicates the number of illustrations—tables and figures. The third and

fourth columns give details about the PDF files—whether the work was submitted as one large file (as is traditional when submitting a thesis or dissertation as a single volume) or as multiple files—sometimes with chapters as separate files and sometimes with multimedia (usually motion and sound files) in separate files. Most authors submit their works as single files. Several of these interesting works are large, due at least in part to the number of color graphics included. While four out of seven are from computer science and engineering, the others are from interior design, landscape architecture, and history (the Civil War). Several of the ETDs coming from architecture, in particular, are beginning to make more creative use of the online medium.

### Schaeffler ETD

Only a few students have **not** submitted the first page of their ETD in traditional layout, but these two have covers that better fit screen displays and add interest to the works, similar to a book jacket. The first is a dissertation from engineering mechanics by Norm Schaeffler and the second is a thesis from landscape architecture by David Orens.

Both are extensively illustrated with rich color graphics.

### Orens' ETD

The body of David Orens' ETD uses an interesting layout that is better designed for screen display—horizontal (i.e., 8.5 x 11 inches) with a pale background text in a far-right column overlaid with readable text. In addition to his interesting design and layout, his graphics include many links to Web sites, both internal (e.g., to a glossary of terms) and external (e.g., to the National Gallery of Art).

Theodoros David's ETD includes bookmarks and thumbnails, as well as color illustrations. In the *New York Times* for Sept. 12, 1998, he revealed that he was recruited by several employers because his work was available online. [DAVI].

David DeVaux's work is about developing a tutorial using AuthorWare. He includes figures and screen dumps in the body of his ETD with more in the appendix. These are obvious from the thumbnails he created for improved online display. In conjunction with this "special report," he also developed files for students to use to help them

generate their own AuthorWare programs that he included in a package given to his committee chair. For class purposes, there is also an extract of the tutorial, another PDF file of 1.6M. In addition there are two AuthorWare files, 50K and 264K, an AuthorWare library of 215K, and three QuickTime files (17K, 17K and 578K) [[DEVA](#)].

Richard Hephner turned in a “plain vanilla” ETD, that is it would look just like a paper thesis when printed, including line graphics, charts, and tables. It lacks any enhancements such as thumbnails, bookmarks, or Web links. However, digital images (once black and white photographs) are quite dramatic and would have been expensive to reproduce for each paper copy previously required. [[HEPH](#)].

Xiangdong Liu’s ETD has copious excellent digital images and other graphics as well as some illustrations of problems possible when scanning improperly [[LIU](#)]. He did not include thumbnails or bookmarks, however, to enhance document navigation.

### Oral’s ETD

Timur Oral’s thesis includes two QuickTime video segments demonstrating the sights and sounds of

Turkish coffee houses. There are also very colorful and detailed images in his ETD, including Turkish rugs, pottery, and tiles. His appendix includes the letter of permission from the publisher allowing him to include copyrighted works in his VT ETD. He also did not include thumbnails or bookmarks, however, to enhance document navigation.

### CONCLUSIONS AND FUTURE WORK

ETDs are one genre within the larger world of electronic publications, but they represent major changes and major challenges to established ways of thinking and operating within the academic and research communities. It is clear to the participants in the NDLTD and especially to its manifestation at Virginia Tech that the benefits heavily outweigh any negative aspects.

Since our educational initiative targets all graduate students, it is unique in its potential to train future generations of scholars, researchers, and professors [[FOX97a](#)]. ETDs may be a key driving force for sharing knowledge and culture. If all theses and dissertations are captured electronically and most are freely shared, there will be tens of thousands of new works each year. They will cover diverse topics like history, sociology, linguistics, religion, and architecture that will directly help people learn

about other cultures. The more technical works will, among other things, help readers learn about methods and approaches adopted by groups in distant locations. Many unanticipated benefits are likely to happen such as when Professor Jong-Min Bae came from Korea to spend a sabbatical year at Virginia Tech during 1997/1998, and ETD team members are invited to make presentations throughout the world. This genre is being transmitted globally in a variety of ways from accidental Internet encounters to very personal interactions between scholars, researchers, and authors. Digital libraries can help us share knowledge and culture on an international scale, especially when we can learn so much from a very uniform genre like ETDs.

This paper has touched on some aspects relating to this new genre called ETD. We are striving to promote and document its evolution and to encourage the improvement of graduate education and the increase in knowledge sharing that can accompany use of electronic theses and dissertations.

## References

## ACKNOWLEDGMENTS

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## Virginia Tech Electronic Theses and Dissertations

**ETDs unlock access to graduate research**

<http://scholar.lib.vt.edu/theses/>

Of General Interest	<i>Primarily for Graduate Students</i>
<p><b>Find an ETD</b></p> <ul style="list-style-type: none"> <li>● <a href="#">Browse VT ETDs</a></li> <li>● <a href="#">Search VT ETDs</a></li> <li>● <a href="#">Federated Search</a> searches multiple ETD sites</li> </ul> <p><b>User Survey Form</b> <a href="#">Share your opinions</a></p>	<p><a href="#">Introductory Workshops</a></p> <p><a href="#">Submission Information</a> <a href="#">Preparing a Virginia Tech ETD</a>  flier</p> <p><a href="#">Copyright Information</a></p>
<p><b><u>Networked Digital Library of Theses &amp; Dissertations</u></b>  <a href="#">NEW SUBMISSION PROCESS</a>  <a href="#">Members; flier</a>   <a href="#">Steering Committee Minutes</a>  <a href="#">Metadata for ETDs</a> (of general interest!?!)</p>	<p><a href="#">Submission Form</a> Submit an ETD to the Graduate School</p> <p><a href="#">Approval Form</a> Committee signs/approves ETD <i>draft</i> Library-friendly Approval Form</p>
<p><b><a href="#">Facts, Data, Information</a></b> policies, equipment, staff, use, etc.</p>	<div style="text-align: right;">  3.0         </div>

# NDLTD Networked Digital Library of Theses and Dissertations

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Universities, students, publishers, other interested parties, Welcome!

- Researchers, see <http://www.theses.org/> to **search** and **browse** our library of electronic theses and dissertations (ETDs).
- Students, see <http://etd.vt.edu/> for help creating and submitting ETDs.

## What We Are

- An [initiative](#) to improve graduate education, increase sharing of knowledge, help universities build their information infrastructure, and extend the value of digital libraries
- A federation of [member universities](#)
- A project [supported by FIPSE and SURA](#)
- A [project team](#) based at [Virginia Tech](#)
- A recent topic in the [news](#)
- Led by [steering committee](#) and a [technical committee](#)

## What We Do at Virginia Tech

- Require students to develop and submit Electronic Thesis or Dissertations (ETDs)
- Provide a [web site](#) to help students
- Support a [digital library](#) of ETDs
- Develop a [workflow model](#) for submitting ETDs
- Give [talks](#)
- Write [papers](#)

## How YOU Can Participate

- Come to [organizational meetings](#)
- [Join us](#) and develop your own NDLTD member site with our help!
- Contribute to our [e-mail list\(s\)](#)

## Our Objectives

- **To improve graduate education** by allowing students to produce electronic documents, use digital libraries, and understand issues in publishing
- **To increase the availability of student research** for scholars and to preserve it electronically
- **To lower the cost** of submitting and handling theses and dissertations
- **To empower students** to convey a richer message through the use of multimedia and hypermedia technologies
- **To empower universities** to unlock their information resources
- **To advance digital library technology**

## Further Information

- Statistics on [usage](#) of Virginia Tech collection
- General and historical [information](#)
- Information for [publishers](#)
- Information for [administrators of NDLTD sites](#)
- Other places that publish dissertations: [UMI](#), [Dissertation.com](#), [Diplomica](#)
- Issues in [copyright](#)
- Doctoral students can win an [Innovation Grant](#)
- Links to [related projects](#)
- Links to [related \(meta-\)initiatives](#)

Questions? Comments? [etd@ndltd.org](mailto:etd@ndltd.org)



## **VT ETD WEB INFORMATION: 5 AREAS**

### **Information for students**

- Policies
- Checklists
- Training materials

### **Access to ETDs**

- Browse
- Search (managed with the OpenText LiveLink software)

### **Information for other universities: NDLTD**

- How to start an ETD project
- ETDs as part of digital library initiatives

### **Research and development**

- SiteSearch from OCLC
- IBM DL

### **Processing and storage**

## VT ETDs: Accessibility

	Unlimited Access	University- only Access	Mixed Access	Unavailable	Total VT ETDs	
	no. of files	no. of files	no. of files	no. of files	no. of files	% of files
1995/1998						
theses	369	254	4	134	761	52.34%
dissertations	283	234	3	156	676	46.49%
others	11	4	0	2	17	1.17%
<i>Totals</i>	<i>663</i>	<i>492</i>	<i>7</i>	<i>292</i>	<i>1454</i>	
<b>% 95/98</b>	<b>45.6%</b>	<b>33.8%</b>	<b>0.5%</b>	<b>20.1%</b>		
1998						
theses	268	163	4	87	522	50.19%
dissertations	214	164	3	124	505	48.56%
others	9	3	na	1	13	1.25%
<i>subtotal</i>	<i>491</i>	<i>330</i>	<i>7</i>	<i>212</i>	<i>1040</i>	
<b>% 1998</b>	<b>47.2%</b>	<b>31.7%</b>	<b>0.7%</b>	<b>20.4%</b>		
1997						
theses	96	90		46	232	57.57%
dissertations	66	69		32	167	41.44%
others	2	1	na	1		
<i>subtotal</i>	<i>164</i>	<i>160</i>		<i>79</i>	<i>403</i>	
<b>% 1997</b>	<b>40.7%</b>	<b>39.7%</b>		<b>19.6%</b>		

Table 1

## Media in 1454 VT ETDs

file formats used <i>file formats recommended</i>	Totals
<b>image:</b> bmp, dxf, gif, jpg, tiff <i>CGM, AutoCAD (dxf), GIF, JPEG, PDF, PhotoCD, TIFF</i>	322
<b>sound:</b> aiff, mcd, wav <i>AIF, CD-DA, CD-ROM/XA, MIDI, MPEG-2, SND, WAV</i>	18
<b>movie:</b> avi, mov, mpg, qt <i>MPEG, QuickTime, Encapsulated Postscript</i>	48
<b>other:</b> macromedia, SMGL, XI <i>Authorware, Director, Excel</i>	88
<b>text:</b> doc, pdf, txt, xls <i>ASCII, PDF, SGML, ETD-ML</i>	5247

Table 2

## Types and Years of VT ETDs

% of ETDs	type of ETD	total	year of degree	year of degree	year of degree	year of degree	year of degree	year of degree
			1993	1994	1995	1996	1997	1998
46.0%	dissertations	711	1	1	2	35	167	505
52.8%	theses	817	4	5	5	49	232	522
0.6%	reports	9				1	1	7
0.6%	major papers	9					3	6
	<i><b>totals</b></i>	1546	5	6	7	85	403	1040
	<i><b>% of all ETDs</b></i>		0.32%	0.39%	0.45%	5.5%	26.1%	67.3%

Table 3

**[scholar.lib.vt.edu/theses/](http://scholar.lib.vt.edu/theses/)  
University Libraries VT ETD Web site**

**Files Requested Annually**

<b>1996</b>	<b>1997</b>	<b>% increase 1996-97</b>	<b>1998</b>	<b>% increase 1997-98</b>	<b>Description</b>
37,171	247,573	85.0%	628,401	60.6%	Total successful requests
102	685	85.1%	1,690	59.5%	Avg. successful requests/day
4,600	72,854	93.7%	343,236	78.8%	PDF file downloads
28,225	129,831	78.3%	215,896	39.9%	HTML file downloads
9,015	22,725	60.3%	36,724	38.1%	Distinct hosts served
3.229	25.953	87.6%	74.051	65.0%	Gbytes transferred
9.038	73.574	87.7%	222.659	67.0%	Avg. Mbytes transferred/day

Table 4

## VT ETD Accesses by Internet Domains

<b>domain extension</b>	<b>1996</b>	<b>1997</b>	<b>% Increase 1996/1997</b>	<b>1998</b>	<b>% Increase 1997/1998</b>	<b>Domain</b>
.edu	15,314	112,876	637%	254,268	125%	USA Educational
.com	5,309	48,540	814%	88,169	82%	Commercial, mainly USA
.gov	282	1,362	383%	6,885	406%	USA Government
.mil	188	1,872	896%	3,475	86%	USA Military
.net	2,522	14,026	456%	27,972	99%	Networks
.org	375	3,132	735%	1,434	-54%	Non-Profit Organizations

Table 5

## International Accesses to VT ETDs: 1996-1998

accesses 1996	rank* 1996	accesses 1997	rank* 1997	1996/97 increase	country	1998	1997/98 increase
850	1	2922	1	244%	1. United Kingdom	8170	180%
346	6	2378	3	587%	2. Germany	7373	210%
463	4	1161	6	151%	3. France	4431	282%
608	3	2501	2	311%	4. Australia	4223	69%
713	2	2367	4	232%	5. Canada	3970	68%
191	10	867	10	354%	6. Netherlands	2781	221%
250	8	725	12	190%	7. Italy	2553	252%
101	16	495	16	390%	8. Japan	2456	396%
387	5	1264	5	227%	9. South Korea	2201	74%
106	15	176	27	66%	10. Spain	1844	948%
117	14	113	32	-3%	11. Indonesia	1826	1516%
230	9	653	13	184%	12. Singapore	1732	165%
183	11	1130	7	517%	13. Brazil	1449	28%
83	17	958	9	1054%	14. Greece	1414	48%
255	7	432	18	69%	15. Finland	1098	154%
22	29	967	8	4295%	16. Thailand	1089	13%

\* by number of accesses

Table 6



### **Most Accessed VT ETDs: 1996**

out of 103 voluntary ETDs submissions

<b><u>Accesses</u></b>	<b><u>Mb</u></b>	<b><u>Degree</u></b>	<b><u>Year</u></b>	<b><u>Department</u></b>	<b><u>Author</u></b>
458	1	PhD	1993	Educational Research	Seevers
432	0.24	MS	1995	Science & Technology Studies	Hohauser
390	0.29	MS	1994	Technology Education	Childress
310	2	PhD	1995	Electrical Engineering	Kuhn
287	0.88	MS	1993	Electrical Engineering	Sprague
165	0.48	MS	1993	Sociology	Wallace
150	3	PhD	1996	Aerospace Engineering	McKeel

Table 7

**Most Accessed VT ETDs: 1997**  
out of 506 ETDs

<u>Accesses</u>	<u>Mb</u>	<u>Degree</u>	<u>Year</u>	<u>Department</u>	<u>Author</u>
9920	6.5	PhD	1996	Computer Science	Liu
7656	5	PhD	1997	Electrical Engineering	Petrus
2781	7	PhD	1997	Engineering Mechanics	Agnes
2492	4.6	PhD	1996	Physics	Gonzalez
1877	3.3	PhD	1997	Engineering Mechanics	Shih
1791	3.2	MS	1996	Electrical Engineering	Saldanha
1431	2.3	MS	1996	Computer Science	DeVaux
1394	2.5	PhD	1995	Electrical Engineering	Kuhn

Table 8

## Most Accessed VT ETDs: 1998

<u>Accesses</u>	<u>Mb</u>	<u>Degree</u>	<u>Year</u>	<u>Department</u>	<u>Author</u>	<u>Tables &amp; Figures</u>
75339	12	PhD	1997	Mechanical Engineering	Maillard, Julien	38 & 174
55955	6.5	PhD	1996	Computer Science	Liu, Xiangdong	8 & 93
20182	3.9	PhD	1997	Electrical Engineering	Laster, Jeffery	9 & 121
14887	4.9	PhD	1997	Electrical/Computer Engin.	Tripathi, Nishith	17 & 127
12243	6.6	MS	1997	Electrical Engineering	Nicoloso, Steven	7 & 96
6673	4.6	PhD	1996	Physics	Gonzalez, Reinaldo	8 & 62 (32 color)
6483	4.9	PhD	1997	Electrical Engineering	Petrus, Paul	16 & 125
5888	12.4	MS	1998	Mechanical Engineering	Tyberg, Justin	2 & 36
5497	4.9	PhD	1997	Mechanical Engineering	Walker, Gregory	16 & 67 (+2 .avi)
5035	5.5	MS	1997	Interior Design	Oral, Timur	0 & 46 (+ 2 .qt)

Table 9

## Characteristics of VT ETD Case Study

author	no. of figures /titles	no. of PDF files	PDF Mb	Other Mb	Degree	Year	Department
David	35	1	0.65		M.S.	1997	Electrical Engineering
<i>Networking Requirements and Solutions for a TV WWW Browser</i>							
DeVaux	74	2	2.3	1.1	M.S.	1996	Computer Science
<i>Tutorial on Authorware</i>							
Hephner	4	1	0.4		M.A.	1997	History
<i>"Where Youth and Laughter Go:" Trench Warefare from Petersburg to the Western Front</i>							
Liu	89	1	6.6		Ph.D.	1996	Computer Science
<i>Analysis and Reduction of Moiré Patterns in Scanned Halftone Pictures</i>							
Oral	46	1	5.6	7.1	M.S.	1997	Interior Design
<i>Contemporary Turkish Coffeehouse Design Based on Historic Traditions</i>							
Orens	145	1	4.6		M.Arch.	1997	Landscape Architecture
<i>an end to the other in landscape architecture poststructural theory and universal design</i>							
Schaeffler	120	1	40.4	5	Ph.D	1998	Engineering Mechanics
<i>All the Kings Horses: Delta Wing Leading-Edge Vortex System Undergoing Vortex Breakdown...</i>							

Table 10



# ALL THE KING'S HORSES:

The Delta Wing Leading-Edge Vortex System Undergoing Vortex Breakdown:  
A Contribution to its Characterization and Control under Dynamic  
Conditions.

By  
Norman W. Schaeffler

Dissertation submitted to the Faculty of the  
Virginia Polytechnic Institute and State University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY  
IN  
ENGINEERING MECHANICS

APPROVED:

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April 20, 1998  
Blacksburg, Virginia  
The United States of America

Key Words: Delta Wing Aerodynamics, Vortex Breakdown, High Angle of Attack Control  
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## CHAPTER 1: INTRODUCTION

When a uniform stream encounters a delta wing at a positive angle of attack, the flow attaches to the windward side of the wing. A line of attachment is formed coincident with the centerline of the wing and the flow is diverted either to port or starboard. Boundary layers develop on the windward side of the wing, originating at the line of attachment and developing as the fluid moves towards the leading edge. Upon reaching the leading edge, the boundary layers, unable to negotiate the sharp corner of the wing, separate and form two free-shear layers. These free-shear layers in turn, organize themselves on the leeward side of the wing into a symmetric pair of counter-rotating vortices. The existence of these two vortices is the essence of the delta wing flowfield. The vortices induce axial velocities within their cores on the order of two to three times the free-stream velocity and support circumferential velocities approaching two and a half times the free-stream velocity. These large axial velocities generate an incremental lift for the wing, usually referred to as vortex or non-linear lift. The vortex strength and hence, the axial velocity induced in the core, increases as the angle of attack increases, but only up to a point. Above a critical angle of attack, a fundamental change in the structure of the vortex occurs and the high axial velocities within the core can no longer be sustained. The axial velocity decreases, the vortex grows in diameter and the circumferential velocities correspondingly decrease. The vortex has “broken down”.

### *1.1 Delta Wing Aerodynamics*

The typical airframe application of the delta wing is the jet fighter. The requirements for a high-performance “supermaneuverable” fighter aircraft dictate a blend of high supersonic cruise ability and optimal low speed control. It is for the former reason that the delta wing is the planform of choice. The latter requires a wing with excellent low Mach number flight characteristics, a well-known weakness of delta wings. The presence of the

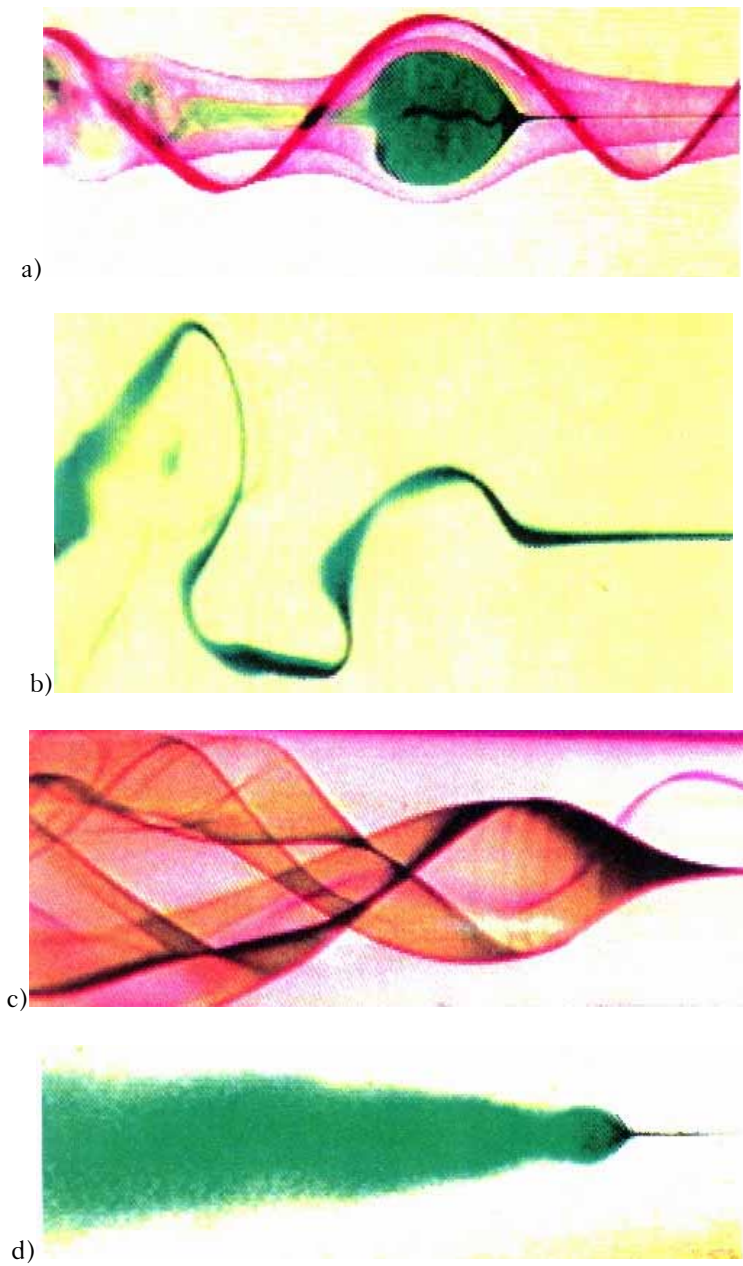
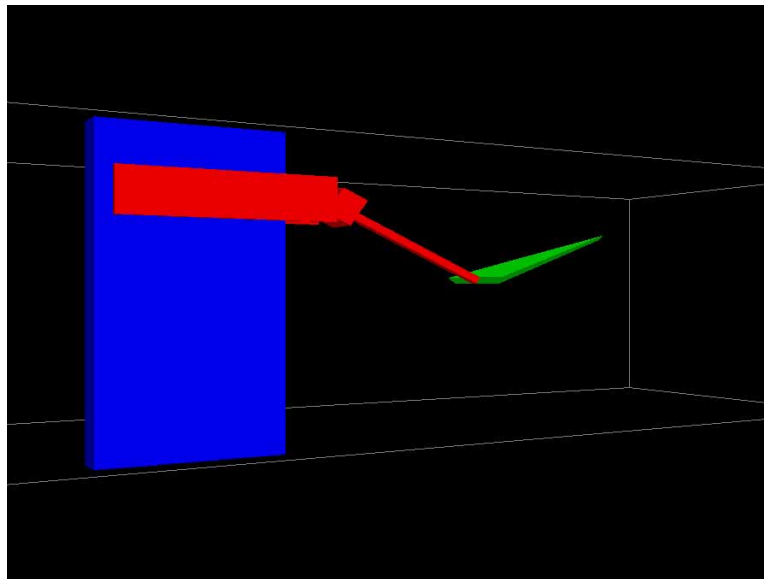


Figure 1.2: The four types of vortex breakdown as defined by Sarpkaya. a) bubble, b) spiral, c) double helix, and d) conical. Vortices are visualized by the use of dye. Photographs are from Sarpkaya (1994).



valid. Since access to the raw voltages sent out of the D/A board was lost, a different technique was required to deploy the flaps with the new motion file format, dubbed the General Motion File format or the GMF format. The new system involved using a hardware counter to count a clock train from the DyPPiR control computer. This clock train was in sync with the D/A conversions of the command signals. The counter was pre-set with a value and triggered the flaps once that count was met.

So the reader can gain a better understanding of the physical arrangement of the DyPPiR, Media Object 1.1 presents a computer-generated image of the DyPPiR, which is from a piece of software used to test motions for the DyPPiR, the DyPPiR Simulator. The image is a link to a Quick Time Virtual Reality (QTVR) movie of the DyPPiR as it appears in the DyPPiR Simulator.



Media Object 2.1: The DyPPiR as seen in the DyPPiR Simulator used to test motions. The blue rectangle is the pylon, the red objects are the carriage and sting, and a green delta wing of 1.00-meter chord is attached at a 50° offset. Grey lines represent the bounds of the tunnel. All objects are drawn to scale. Click the image above to access a QuickTime Virtual Reality (QTVR) movie of the DyPPiR Simulator. Click here to see the DyPPiR execute a maneuver.

However, bubble paths can be seen in the right vortex also and they could only get in there through periodic rapture of the separatrix between saddles  $S'_1$  and  $S_3$ .

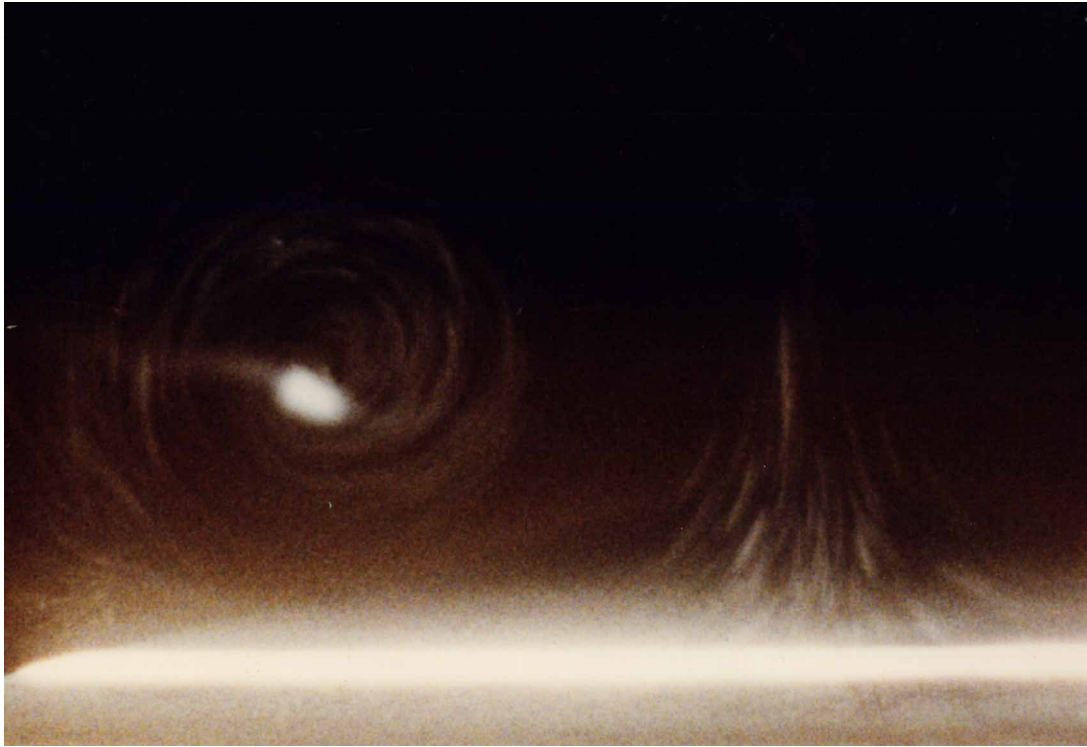


Figure 3.11: Visual evidence of the unstable nature of the saddle-to-saddle connection between the two delta wing vortices.

The image in Figure 3.11 was the inspiration for the development of a new visualization technique for the leading-edge vortex. It would be informative to look at a sectional cut similar to that in Figure 3.11, but with the particle traces within the “light sheet” color coded as to the origin in the flow of the streamline that the particle trace is part of. By color coding the starting location of each streamline we can identify how fluid particles, or streamlines, which originate at the leading edge or anywhere upstream are incorporated into the structure of the leading edge vortex. Several start sites for the streamlines are selected. By varying the viewing plane, the “light sheet”, it can be seen how different parts of

#### 4.2.2 Experimental Conditions for Cavity Flap Deployment during a Maneuver

Experiments involving cavity flap deployment were conducted in two facilities, namely the Virginia Tech Stability Wind Tunnel and the ESM Wind Tunnel. This permitted testing over a range of Reynolds numbers from  $10^5$  to  $10^6$ .

In the Stability Tunnel the Black model was equipped with a set of deployable cavity flaps. Two Bimba 1.125-inch bore pneumatic actuators were installed in the model. A clevis and linkage connect the actuator to a lever arm, which is connected directly to one of the flaps. A hole was machined through the wall of the model to allow the lever arm to pass through and connect to the flaps. Mechanical drawings for the flaps and all the linkage parts are contained in Appendix A. The flaps themselves are hinged along the bottom of the model and when not deployed, are stowed flush along the side of the model. The cross section of the wing is virtually unchanged with the flaps stowed. Photographs of the flaps deployed and stowed on the Black model can be seen in Figure 4.19.

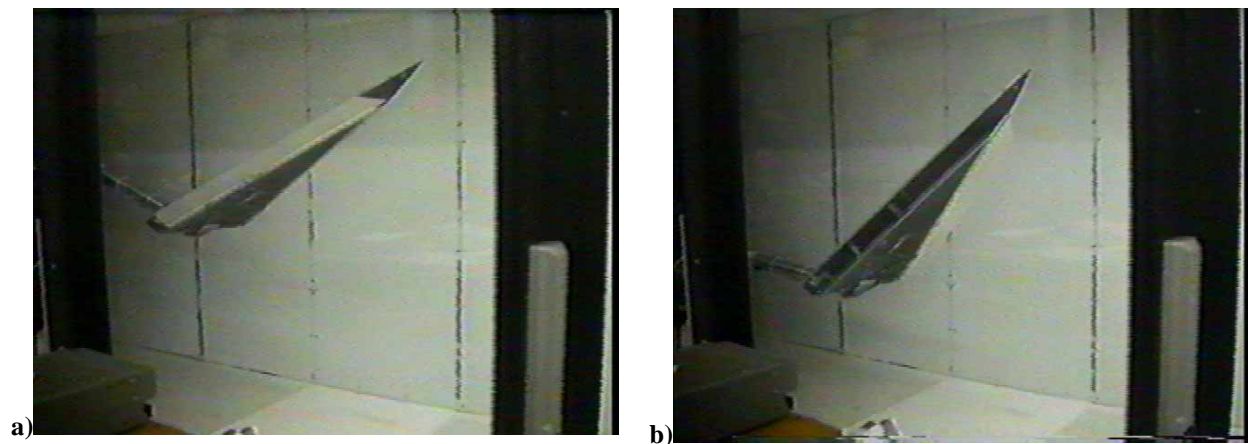
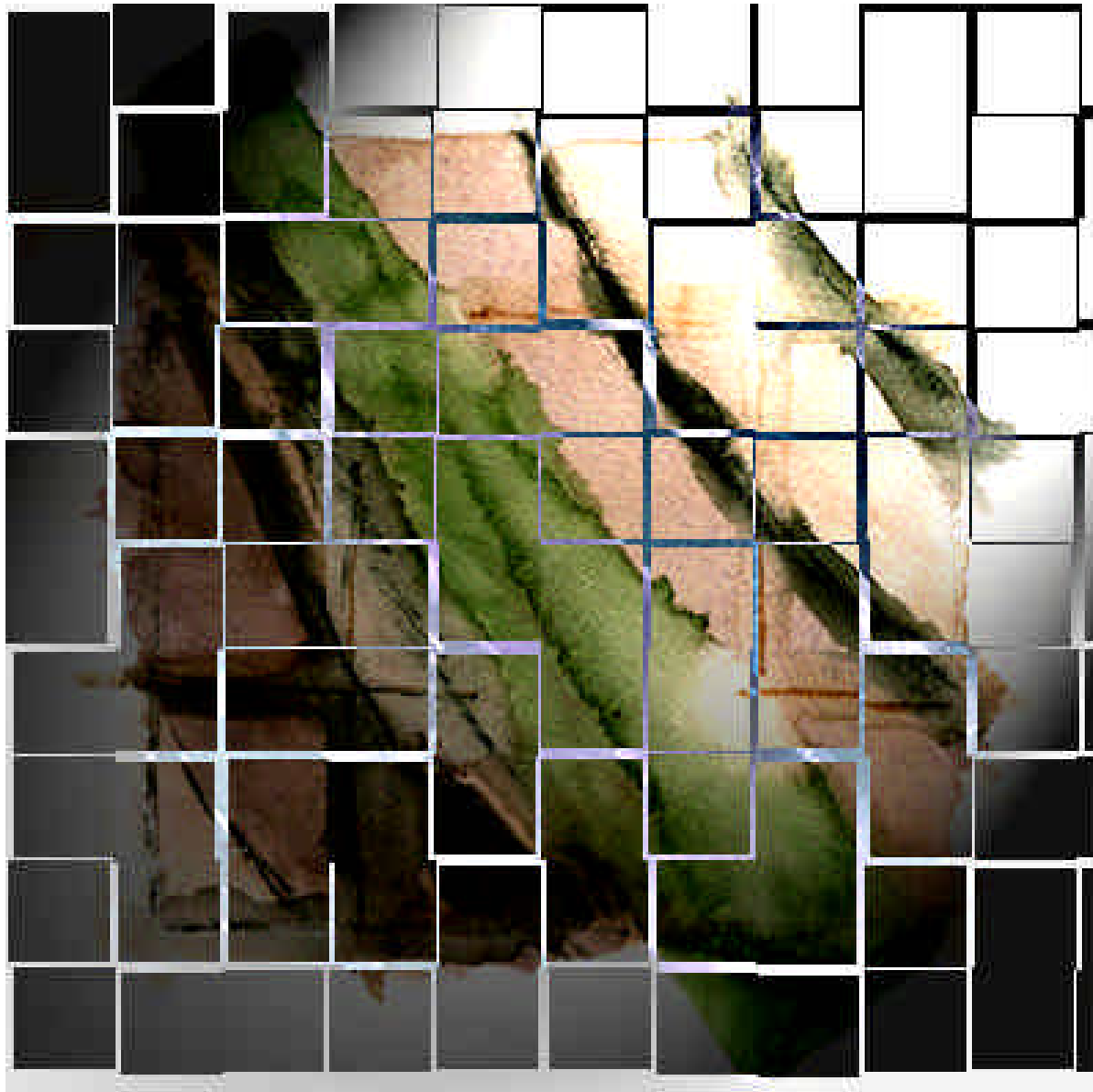


Figure 4.19: Video captured images of the Black model mounted on the DyPPiR with its cavity flaps, (a) stowed, and (b) deployed.

The pneumatic hoses that feed the actuators come out of the model through a hole in the trailing end of the model. The hoses are then secured to the sting and brought back out of the tunnel to the control valves. The control valve assembly consists of a bank of three-way



d a v i d m. o r e n s

an  
end  
to  
the  
'other'  
in  
landscape  
architecture:  
poststructural  
theory  
and  
universal  
design

**an end to the ‘other’ in landscape architecture:  
poststructural theory and universal design**

by  
DAVID M. ORENS

Thesis submitted to the faculty of the  
**Virginia Polytechnic Institute and State University**  
in partial fulfillment of the requirements for the degree of

MASTER  
OF  
LANDSCAPE ARCHITECTURE

Approved:

**Dean Bork, Chair**

**Terry Clements**

**William Green**

April 30, 1997  
**Blacksburg, Virginia**

**Keywords:**

Design Theory, Cultural Theory, Accessibility, ‘Disability,’  
Segregation, Deconstruction

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## Chapter 1

### Introduction: The shifting paradigm...

Accessibility in landscape architecture and architecture is too often only approached in terms of its formal implications. How can this landscape or this building, we ask, be brought into compliance with the accessibility codes, or be initially designed as ‘accessible?’<sup>1</sup> These texts are an attempt to expand the limits of that conception, to engage the social and cultural agencies which influence our concept of accessibility. This is, inevitably, no less of a fiction than the current approaches to accessibility, and it is difficult to propose that what is written here is in opposition to some current way of thinking – as if I, or it, could ultimately transcend the conditions of the ‘reality’ from which it develops. Nor can I say that I have located all of the ‘right’ problems, although such an activity is definitely on the agenda – to challenge the complacent and the regressive, to question social conditions, to resist the structures and institutions that serve the powerful and perpetuate powerlessness. But, as author Lynn Tillman says, “I must contribute daily, involuntarily, but in small and big ways toward keeping the world the way it is” (*Critical Fiction* 2-3).<sup>2</sup>

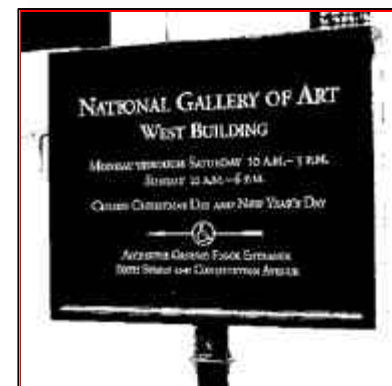
- agency
- fiction
- text.1

<sup>1</sup> Throughout the text, single quotes are used to suggest a questioning of the concept within the quotes. These “scare quotes” as writer Susan Wendell calls them are intended to bring to the reader’s attention those concepts or ideas that the ‘author’ believes are in need of examination and critique. They are many times words used in everyday language which have come to have certain implications that the author intends to challenge and they are many times concepts which can have negative implications associated with them. They are also occasionally used as quotes within direct quotes and unless otherwise noted should be taken as such when they appear within directly quoted material.

<sup>2</sup> This discussion of the positioning of the author is based on a commentary by Tillman in *Critical Fiction / Critical Self*. Says Tillman, “I am wary or shy of proposing my fiction as written in opposition to, or to pronounce that I write differently, as if I – or it – could transcend conditions of birth and development – its and mine -- and was somehow able to escape them. Or even that I knew, and the writing could locate, the right problems. It’s certainly on my agenda – to challenge the complacent, to question the nation, familial, racial and sexual arrangements, to resist structures and institutions that serve the powerful and perpetuate powerlessness. But as I wrote of the narrator in my novel *Motion Sickness* – an American moving from place to place in foreign lands – ‘I must contributor daily, involuntarily, but in small and big ways toward keeping the world the way it is.’ (The question of agency haunts the novel.)” (2-3).



1.1



1.2



as 'other' and considered outside the norm of society. "Accordingly landscapes become documents of power, palimpsests reflective of different value systems and dominance, position, and influence of different social groups within them."<sup>3</sup> Landscapes, in which significant portions of society are treated as second class citizens, still exist. While, with the advent of the **American's with Disabilities Act** (ADA) of 1990 and principles of Universal Design, the built environment as a whole has become dramatically more accessible, separate, and far from equal, types of 'accommodations' still exist.

Universal Design can be characterized as an emerging philosophy in accessible design, which advocates the creation of products, buildings and environments that are accessible to the broadest range of people, without singling out any specific group for special treatment. As a basis for design, it promotes an integrated environment in which issues of accessibility are seen

- 'accommodation' as part of the overall design scheme and not separate
- 'able' accommodations. 'Separate but equal' is generally considered
- 'disabled' unequal when it comes to discrimination based upon race or religion.
- 'integrated' However, separate is exactly what many, if not most, 'handicapped
- 'handicapped' accessible' accommodations continue to be. Universal Design argues
- 'equivalent' at a very basic level that such separate accommodations are an
- 'experience' inadequate solution to the problems of accessibility. Although the

concept has a strong civil rights component, it can be understood not only in the context of the 'handicapped,' but as an issue relevant to society as a whole.

Universal Design aims for a better designed environment for everyone, not just a small portion of society. Said Gordon Mansfield, former chair of the **Architectural and Transportation Barriers Compliance Board**, "Universal Design is 'an approach to design that acknowledges the changes experienced by everyone during his or her lifetime. It considers children, old people, people who are tall or short, and those with disabilities. It addresses the lifespan of the

<sup>3</sup> In "Private Worlds and Public Places," Matthews and Vujakovic explore the issue by examining the extent to which wheelchair users must overcome barriers in the urban environment. p. 1069. See also David Sibley, "Outsiders in society" in Inventing Places.



3.1



3.2



3.3



A CONTEMPORARY TURKISH COFFEEHOUSE DESIGN  
BASED ON HISTORIC TRADITIONS

by

Timur Oral

Thesis submitted to the Faculty of the  
Virginia Polytechnic Institute and State University  
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Housing, Interior Design, and Resource Management

**APPROVED:**

Jeanette Bowker, Chair

Muzaffer Uysal

Eric Wiedegreen

April 16, 1997

Blacksburg, Virginia

**Keywords:** Turkish, coffee, coffeehouse, tradition, culture, franchising, shop design



Figure 7. Polychrome wall tile application and pottery samples of Iznik (Atil, 1980).





Figure 8. Sample Turkish carpet and kilim motifs. The upper two samples are kilims, and the

## ALI PASA OF ÇORLU

- (1) Courtyard
- (2) Indoor Area & Kitchen
- (3) Carpet Shop
- (4) Surrounding Complex

NOT TO SCALE

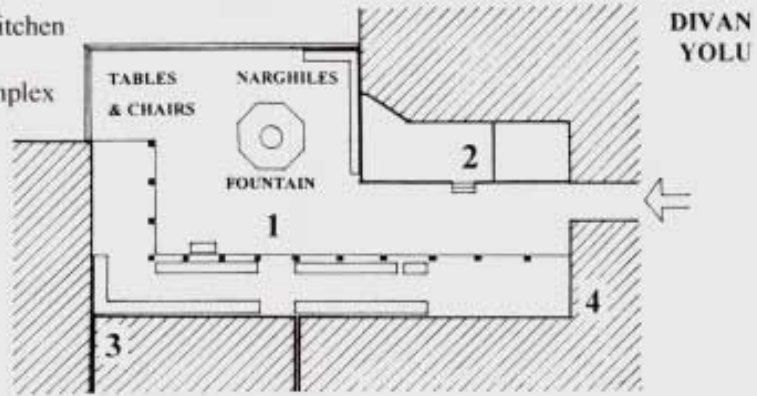


Figure 19. General view and floor plan of *Ali Pasa of Çorlu* coffeehouse.

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