

# NANOMETER

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## Duffield Hall in Design

*One of the most sophisticated* buildings ever planned for the Cornell University campus is now in the design stage. This new research and teaching facility, along with a major landscaping project, could transform the Engineering Quad within three to four years.

*The center, Duffield Hall, will rise* on the quad adjacent to the west side of Phillips Hall and stretch the length of that building. Perhaps the most impressive feature of the three-story building will be a huge atrium connecting Duffield with Phillips and Upson.



*Phillips Hall on a circa 1950's postcard*

*A concurrent project will upgrade* the quad, whose design and planning date back to the 1940s and 1950s. Remodeling options under review include regrading, new paths, lighting, seating, and plantings.

*"The new building is enabling a* planning effort for a new Engineering Quad," said Mark Spiro, associate dean of engineering, who is spearheading the entire project for the College of Engineering.

*Duffield Hall, said Spiro, will be* one of the most advanced university research centers anywhere. The three-story building's first floor will house clean rooms; the second and third floors, wet/dry labs; and mechanical facilities in the penthouse. The largest occupant will be the instruction in electronic and photonic devices, microelectro-mechanical devices, advanced materials processing, and biotechnology devices.

*The Duffield project, said Eric* Dicke, Cornell's director of facilities planning, "has shifted from just research to the added role of being a visual image for the college and being a social gathering space." Suggestions from the engineering community include an air-conditioned atrium—complete with trees and gardens, seating for meetings, and coffee stands—that will provide both a walk-through and areas for group discussions and study.

*The center is now in the schematic* design phase in which interior spaces, facades, entrances and exits, and public spaces will be designed. The architectural firm of Zimmer Gunsul Frasca Partnership, with offices in Portland, Seattle, Los Angeles, and Washington, will lead the work. Design is expected to take about a year, and construction should begin in the fall of 2000 or winter of 2001.

*Landscape architectural firm* EDAW of Washington, D.C., has also

begun work on the design for renovation of the Engineering Quad. A third related project being planned will renovate the classrooms and other spaces fronting Duffield Hall in Phillips and Upson Halls.

*The impetus for the project is a \$20* million gift from David A. Duffield, chief executive officer and founder of PeopleSoft Inc., Pleasanton, Calif., who graduated from Cornell with a bachelor's degree in electrical engineering in 1963 and a master's degree in business administration in 1964. To date a little more than half the funding necessary to build and fit-out the projects is pledged or in hand.

*Periodic progress reports and* design concepts will be published in Cornell Engineering Magazine. For more information please contact Mark Spiro, associate dean and project director for Duffield Hall, at or 249 Carpenter Hall.

Cornell News Service and staff reports  
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# New Equipment

As a result of a lot of hard work by our staff and some good luck, a large amount of equipment is descending upon CNF - some of it is already here in storage, some will arrive over the next 2-9 months. Some of it has been purchased and some of it was a gift from Intel.

Here is a list:

- A JEOL Field Emission SEM (Intel)
- A used, but more versatile ion mill
- A new P-10 Tencor thickness profiler, much more advanced than the Alphastep 200's
- Two Gasonics Auro 1000 Plasma Ashers (Intel)
- A new PECVD system from GSI
- A 2nd Bosch etcher
- A 5X i-line stepper
- A new ebeam evaporator (the dual e-gun is already gone)
- A Tencor 750 Thin Film Measuring tool (Intel)
- A hot embosser
- Several Applied 5000 CVD Cluster tools (may stay in storage for a while) (Intel)
- Several advanced optical microscope systems (Intel)
- A set of spin rinse dryers (Intel)

In order to accommodate this influx, there will be considerable shuffling and some analytical equipment will need to go into the non-clean space in 126 Phillips. And inevitably some equipment will be retired. Three of the pieces facing retirement are approximately 20 years old and are difficult or impossible to support. And the equipment to be retired is either not being used, or we have a migration path to better technology.

So, after some discussion, we are planning to make the following changes. Immediately: (March 20)

Decommission the Plasma Therm PK 1250 etcher. (the Old Man) It is terminally limited to 3" wafers. All users have been migrated to the Plasma Therm 720, a more capable and versatile tool.

Soon, within approx. 6 weeks, we will:

Decommission the old ion mill, once the new one is installed and working. The old ion mill will be sold or used for parts.

Decommission the Branson plasma asher, once the Gasonics Aura1000 is installed and characterized. We will assure that the the Gasonics will replace the processes currently done on the Branson. Once we are convinced that the Branson is redundant, it will be sold or trashed.

Within 4 months, it will probably be necessary to decommission the MIE. (It is also terminally limited to 3" wafers and parts are no longer available.)

We also are going to investigate:

Moving the Suss MA6 contact aligner to storage - reinstall in Duffield (we still will have 2 active contact aligners). Put a spin rinse dryer in its place. The new EV tool is far superior to the MA6. Some additional tooling will be required and will be provided.

Decommissioning the CAIBE. It receives very little use.

In addition there will be considerable shuffling of equipment in the Ion Implanter room as we make room for the new stepper to be installed there.

The JEOL SEM and our existing Scanning Auger will move into room 126 Phillips, outside the clean room.

If we do all this, we feel that we can accommodate everything except the cluster tools. They will have to wait resolution of the ion implanter issue.

The new tools will significantly enhance the capabilities of the facility. We acknowledge that it will inconvenience some users and some process changes will be necessary. However, if we don't get rid of any old equipment we are unable to add any new equipment and we will become obsolete rapidly.

We think we have adequate coverage for everything that is going, but by all means contact Lynn Rathbun or myself if you have questions or concerns.

Thank you for your cooperation.

Alton H. Clark, Associate Director  
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# The Director's Corner

Year 2000 is bringing with it a lot of change in the Cornell Nanofabrication Facility. Oversubscription of equipment has been a healthy challenge to the staff for quite some time. Changes in research directions bring new demands on equipment faster than we can plan for them.

We have been fortunate this year in equipment acquisitions that directly address current limitations - in time availability or capability. A large donation received from Intel Corporation is gradually being incorporated in the facility. Many of these single wafer tools represent an upgrading from our present capability. Many will reduce the processing time as well as improve process reproducibility and quality.

CNF's goal is to accomplish the changes without affecting ongoing research and with sufficient modifications to the equipment to allow for the large variations in wafer sizes that we work with.

In addition, this year will also see (a) a single wafer tool for low temperature deposition of oxides, doped oxides, amorphous silicon, poly-silicon, and doped amorphous and poly-silicon; (b) an additional deep etching tool for silicon that will permit us to devote separate tools to 3 inch and 4 inch wafer sizes; (c) an additional GCA Autoscan stepper that will help spread the demand in the lithography area; and (d) an ion-beam milling machine with an improved rotating and cooled substrate holder.

Bringing these tools on-line will also be an important experience for us in developing the methods by which we will move to Duffield Hall without affecting ongoing research. The logistics of making room for new or replacement equipment in the limited clean room area is such that, for many of us, Duffield Hall can't happen soon enough.

Sandip Tiwari,  
Lester B. Knight Director of CNF  
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# NNUN REU Program 2000

The last award has been accepted, and here are the next NNUN REU Interns. Our thanks to the NSF for their continued support of our program, and to the faculty and staff at each site who's work and dedication consistently make this program a success.

<i>INTERN</i>	<i>SCHOOL AFFILIATION</i>	<i>CHOSEN BY:</i>
Ms. Karen Ahle	Harvey Mudd College	SNF
<b>Mr. Leonid Viktorovich Alekseyev</b>	<b>CalTech</b>	<b>CNF</b>
Ms. Anna Asanbaeva	UCLA	SNF
Mr. David Badillo Torres	University of PR Aguadilla	PSU
Mr. Austin Brown	Harvey Mudd College	UCSB
Ms. Kwanza Nicole Brown	Eastern College	PSU
<b>Ms. Molly Burton</b>	<b>Adams State College</b>	<b>CNF</b>
Mr. Van Ortega Cayetano	New York University	SNF
Mr. Steven Charles	Brigham Young University	UCSB
Mr. Charlie Alexander Collins II	Lincoln University	UCSB
Mr. Luis Jose Cruz-Rivera	Prairie View A&M University	SNF
<b>Mr. Harmander Deogun</b>	<b>Duke University</b>	<b>CNF</b>
Ms. Nga Nguyet Dinh	University of Nebraska Lincoln	PSU
Mr. Erik Douglas	Purdue University	SNF
Mr. Christian Elebiary	City Collge of San Francisco	UCSB
Mr. William Fadgen	University of Texas Dallas	PSU
<b>Ms. Flora Felsovalyi</b>	<b>Cornell University</b>	<b>CNF</b>
Mr. Andrew Gapin	Georgia Inst of Technology	UCSB
Mr. Nicarter Gordon	University of the Virgin Islands	UCSB
Ms. Nathalie Guebels	UCSB	UCSB
Mr. Jesus Angel Tena Guzman	UCSB	UCSB
Mr. Corey Harris	Washington University (St Louis)	SNF
Mr. Scott Harrison	Rice University	SNF
Ms. Tamisha Hawkins	Xavier University of Louisiana	Howard
<b>Mr. Jeremy Hoff</b>	<b>Duke University</b>	<b>CNF</b>
<b>Mr. Jonathan Hong</b>	<b>University of Pennsylvania</b>	<b>CNF</b>
Mr. Jesse Hwang	Yale University	SNF
Mr. Jevon Johnson	Xavier University of Louisiana	PSU
Ms. Andrea Lewis	Princeton University	Howard
<b>Ms. Wendi Maeda</b>	<b>University of Hawaii Manoa</b>	<b>CNF</b>
Ms. Jenea McLaughlin	University of Pennsylvania	Howard
Ms. Kieche Meleson	UCSB	UCSB
Mr. Aghapi Mordovanaki	University of MI Dearborn	SNF
<b>Ms. Catherine Newman</b>	<b>University of CA Berkeley</b>	<b>CNF</b>
Ms. Ly Xuan Thi Nguyen	Colorado State University	PSU
Ms. Sasha Rodriguez Gonzalez	Louisiana State University / PR	Howard
<b>Mr. Jason Slinker</b>	<b>Southern Nazarene University</b>	<b>CNF</b>
<b>Ms. Sharelle Speller</b>	<b>Spelman College</b>	<b>CNF</b>
<b>Ms. Virginia Starke</b>	<b>NM Inst of Mining and Tech</b>	<b>CNF</b>
<b>Ms. Jennifer Sui</b>	<b>University of CA Davis</b>	<b>CNF</b>
Mr. Eric Taketatsu	University of Hawaii Manoa	SNF
Ms. Andrea Tao	Harvard University	SNF
Mr. Christopher Utley	UCSB	UCSB
Mr. James Ryan Williams	Santa Clara University	SNF

## The 2000 CNF Annual Meeting and Career Fair

*The CNF Annual Meeting and Career Fair is:*

- Oral and Poster Presentations which allow CNF's students and users to show you their research and discoveries.
- Informal lunches which offer additional one-on-one time with students and faculty members.
- Thursday night dinner: a more formal occasion to meet, and hear an invited speaker.
- An opportunity for CNF and Cornell University engineering students to learn about your career opportunities in engineering or related industries.
- A proactive event designed to help you illustrate the benefits of employment in your company, including internships or full-time experiences, to a focused group of engineering students.
- An opportunity to complete on-campus interviews with experienced nano-fabricators.

To attend, please contact Melanie-Claire Mallison, CNF Corporate & Public Relations, at: 607-255-2329 or mallison@cnf.cornell.edu

## Attention CNF PIs and USERS

It is almost Annual Report time when we ask PIs to submit a Status Report, and Users to submit a Technical Report. Status Reports will be available on the web for PIs to update and return to Carol Cleveland by June 9th. And Melanie-Claire Mallison must receive a Tech Report from all Users by June 9th.

A mailing with a full description of the reports and their requirements will be sent out May 5th -- look for it, and...

**Submit those reports!!**

## New Staff at CNF

*Vincent Genova completed his* undergraduate work in physics at SUNY Binghamton and his graduate studies in applied physics at Cornell University. He then joined IBM at the E. Fishkill Development Lab. In his tenure at IBM, Vince concentrated on advanced III-V microelectronic device development and process integration. He was later responsible for technical direction and management of the GaAs Engineering Development Lab at IBM Federal Systems in Owego, NY. There he developed MMICs based on advanced transistor structures including MODFETs and HBTs. In addition, he was the principal investigator of a joint IBM/CNF project using electron beam lithography for high performance MMICs. He later joined the Eastman Kodak Research Labs in Rochester, NY where he worked on process integration for MEMS based devices. Vince joined the CNF research staff in 1999 as the MEMS Exchange

Engineer and coordinates MEMS processing for outside users.

*Roberto Panepucci received his B.S.* and M.S. in Physics from the Universidade de Sao Paulo at Sao Carlos, in Brazil. He received his PhD from the Electrical and Computer Engineering Dept. at the University of Illinois at Urbana-Champaign. In his thesis he investigated the fabrication of compound semiconductor nanostructures, and their application to optical devices. Roberto's postdoctoral research was carried out at the Universidade de Campinas in Brazil, where he developed AFM lithography towards the fabrication of GaAs based FETs. At UNICAMP he also coordinated the electron beam laboratory at the Center for Semiconductor Components (CCS). Prior to joining CNF, Roberto was lecturing at the Universidade de Mogi das Cruzes in Brazil.

*Daniel Woodie received his B.S. in* Chemical Engineering in 1994 at Virginia Tech. Dan then went to work at Lockheed Martin Space Electronics & Communications in Manassas, VA as a process

engineer in their radiation hardened (i.e. radiation resistant) CMOS production line. Dan says, "One of the highlights of our production line was that our chips ran the Mars Pathfinder and Stardust Explorer missions." While there, he headed the Chemical Mechanical Polishing (CMP) area, worked in the photolithography area, and headed the plasma dry etching section. Here at the CNF, Dan will be working to support the photolithography and MOS areas in addition to working with outside commercial users through the BIC partnership.



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