that pre-Civil war members voted more or less along party lines on economic issues but literally split north and south on the social issue of slavery. In the 20th century, there has been an ideological implosion and the plotted positions have moved closer together. Although, according to Rosenthal, "there's always an economic redistribution conflict coexisting with whatever is a critical disturbing issue at the time."
Pixel: The Magazine of Scientific Visualization, January/February 1990

SURVEY RESULTS SUGGEST INCLUDING AUTOCAD IN CURRICULUM

Charles A. Noran, Department of Geology and Geography, Hunter College, recently completed a survey to determine how and to what degree AutoCAD was being used. The results of his survey were to be used to determine the appropriateness of teaching AutoCAD as part of Hunter College's graduate curriculum in geography.

Utilization

Noran surveyed 100 engineering, cartography, and photogrammetric organizations across the U.S.A. by questionnaire. Forty-one responded. Of those responding, 68 percent were AutoCAD users. Of those, 70 percent relied exclusively on AutoCAD for their automated mapping and GIS needs. The remainder used products such as ARC/INFO, Intergraph, MicroMap, Kork DMS and MPAS 300. Fifty percent of the firms reported using the program for automated cartography, 32 percent for GIS applications, 22 percent for engineering projects and 25 percent for digital photogrammetric mapping. Unfortunately, Noran's questionnaire did not probe more deeply into these applications.

Training

Noran also inquired as to the level and source of AutoCAD training. Organizations reported having between two and twenty trained AutoCAD users. The mean number was eight. Nineteen of the forty-one responding organizations reported conducting in-house AutoCAD training. Five relied exclusively on outside training programs; fourteen relied exclusively on in-house programs. The balance relied on a combination of in- and outside training. On a scale of one to ten, 1 – not useful and 10 – indispensable, the average usefulness of previous AutoCAD training was 6.1.

Conclusion

Based on his survey, Noran concluded that the widespread use of AutoCAD and the prevalence of in-house training programs argue for the inclusion of AutoCAD training in a graduate geography programs. He feels the program's versatility and flexibility will permit its easy integration into a department's curriculum. He recommends its use in courses in automated cartography, photogrammetry and airphoto interpretation, in particular.

AutoCAD — Yes and No

There is no question that AutoCAD has captured a major share of the Computer-Aided Design and Drafting market. From our own research, we know that most photogrammetric firms are frequently required to deliver planimetric and topographic base maps to design engineers in DFX format for use with AutoCAD. In most of these cases, the basemap is produced in a format other than DFX and translated into that format for delivery.

We also acknowledge the growing popularity of AutoCAD-based software, such as TerraCAD, FMS/AC and MunMap-Geo/SQL, for the development of municipal utility system inventories and geographic information systems. Yet, we wonder about Noran's conclusion.

If a geography department considers itself responsible for training personnel for engineering and photogrammetric mapping firms, we agree with Noran. To the degree that it views its mission as the teaching of the principles of cartography and geographic information systems, we suggest that priority be given to programs such as MapInfo, Atlas*Graphics, MapMaker, Atlas* GIS, GISPlus or PC-ARC/INFO.

For additional information, contact Charles A. Noran, (212) 772-5267.
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cart lab bulletin board

This forum is offered to encourage communication among practitioners at a time of rapid technological transition. Questions, comments, and announcements are invited.

ACADEMIC CARTOGRAPHY LABS IN THE U.S. AND CANADA: A SURVEY

Roy Doyon,
University of Massachusetts
Anne Gibson,
Clark University

In mid-1988 we surveyed academic cartography labs in the U.S. and Canada. Our intent was to gather and disseminate information on those labs in the hope of providing some perspective on what academic cartography lab managers do and how their jobs are structured. The survey contained questions on personnel data relating to the lab manager, his or her responsibilities, lab clientele, the type of work performed, production methods, equipment, staffing, and billing policy.

The questionnaire

Two hundred and ten questionnaires were sent out, one to each graduate school of geography in the United States. We also sent questionnaires to a few universities in Canada. Subsequently, we discovered that Ellen White of Michigan State had compiled a listing specifically of academic cartography labs (see page 26). By comparing the two mailing lists, it appears we sent surveys to all the labs on Ms. White's list with one or two exceptions. Seventy questionnaires were returned, representing a response rate of 33 percent. Since many geography departments have no cartography lab, it is more appropriate to look at the response rate for cartography labs alone. Ms. White lists eighty academic cartography labs and we received responses back from forty on her list, or 50 percent. We also received responses from another eleven labs that were not on Ms. White's list, for a total of fifty-one responses or 56 percent out of a known ninety-one labs.

Defining a professional cartographic lab

For our initial analysis, we decided to focus on a subset of forty-three labs — those headed by someone who appeared to have been hired to serve specifically as a cartographer or cartographic lab manager. We chose to set aside about eight labs headed by a teaching faculty member who operated a lab 'on the side.' Although it was sometimes difficult to distinguish between the two on the basis of our questionnaire, an examination of title and time spent teaching yielded fairly good clues. We felt intuitively that there might be a difference between a lab managed by a professor of cartography/geography whose primary responsibility was teaching and research, and a lab run by someone hired primarily for that purpose.

Personnel

We begin by looking at the personnel data on lab managers. First, while most respondents listed the word cartographer in their title, those doing cartographic work had a variety of titles, including cartographic technician/instructional support specialist, university cartographer, cartographic technologist, graphics and cartography lab manager, principal illustrator, senior research assistant, and geological drafting specialist. The respondents' actual personnel classifications (figure 1) ran the gamut from support staff (43 percent) to administrative staff (19 percent) to technical staff (17 percent). 12 percent reported being classified as faculty (figure 1). Two of these were either PhDs or PhD candidates, and one with a master's degree had the title of instructor and staff cartographer. However, other lab managers who taught courses were not classified as faculty.

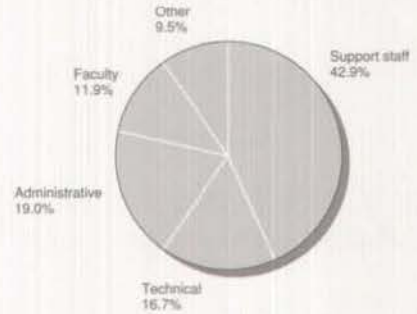

Figure 1: Personnel classification of respondents

Of the forty-one labs responding to this question, a master's degree was the level of education most preferred for this position (59 percent), but 37 percent required only a bachelor's degree. Only one university required its lab manager to hold the doctorate. Of those thirty-seven cartographers indicating their degree, 57 percent held a master's degree (two of whom were pursuing the doctorate) and two held PhDs. Fields of expertise included library science, art, mathematics, physical geography, education and instructional systems technology, in addition to the expected geography or cartography.

Salary statistics (figure 2) are for those thirty-seven respondents indicating that they were employed full-time. Sixty-five percent fell in the $20-30,000 range, fairly equally split above and below $25,000. Of the eleven (30 percent) indicating salaries greater than $30,000, five were Canadian, expressed in Canadian dollars. Four U.S. managers commanded salaries of $30-35,000 and two, $35,000 or more. Of these last two, one held the doctorate and one a bachelor's degree.

$15-20,000	11
$20-25,000	1111111111111
$25-30,000	11111111111C
$30-35,000	1111CC
$35,000+	1CCC

1 = one U.S. manager
C = one Canadian manager (Canadian dollars)

Figure 2: Salary distribution of full-time lab managers

The position of lab manager may or may not include teaching responsibilities. From the wording of the questionnaire, it is difficult to tell whether those indicating salary included in that figure any additional salary for teaching. Of the twenty-seven persons who indicated that they did teach, only ten indicated receiving additional salary for doing so. For some lab managers, teaching was part of their base responsibility, while for others it was an 'extra' that they might provide on top of their regular duties.

Sources of funding

There are three sources of funding for lab manager salaries: from a general college/university budget, from the geography department specifically, or from payment for

work performed. The majority of lab manager salaries (79 percent) were funded wholly by one source: 45 percent by the college, 31 percent by the geography department, and 5 percent from work performed. The remaining eight salaries (19 percent) were funded by two sources. Three received funding from both the college and the geography department, and another three from the geography department and work performed. Two salaries were funded by the college and income from jobs.

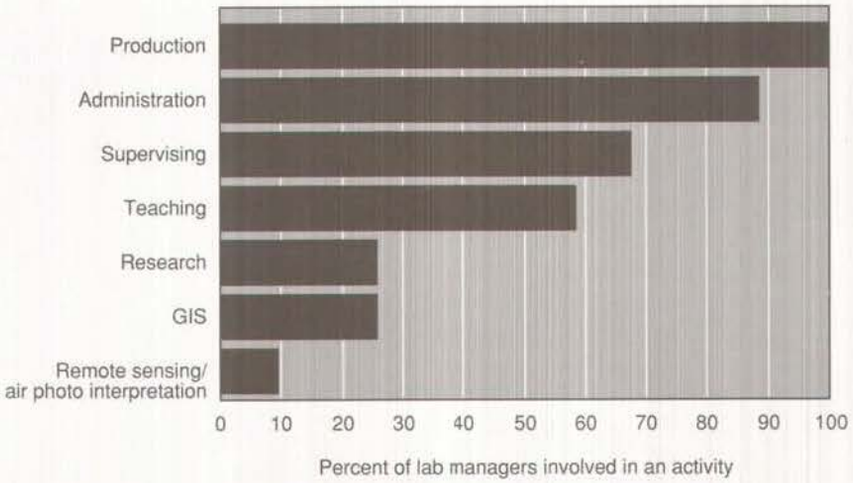

Figure 3: Responsibilities of lab managers

Lab responsibilities

The next section of the questionnaire focused on the responsibilities of the lab manager, including the production of maps and other information graphics, involvement in GIS and remote sensing/air photo interpretation, teaching, cartographic research, administration and supervising. All lab managers, of course, participated in the production of maps and graphics (figure 3). Participation in other possible areas of responsibility varied considerably. A large majority of managers had administrative duties and a smaller majority (67 percent) spent time in a supervisory capacity (not all labs have staff additional to the lab manager). Slightly more than half included teaching among their responsibilities. Only about one-quarter of our sample were involved with GIS or cartographic research, and fewer than one in ten with remote sensing. Figure 4 indicates a rough estimate of the average time spent by lab managers in any one area of responsibility, with about 50 percent of their time devoted to production, another 27 percent to supervising and administration combined, and 11 percent to teaching.

A complementary set of questions gives added perspective on the place and function of cartography labs. Just slightly more than half of lab managers were expected or encouraged to initiate map projects, and only about 33 percent to initiate research or project grants. A little over 40 percent were encouraged or expected to solicit business outside the university. One manager wrote that he was prohibited from competing with local businesses. The non-profit or public nature of the college in which the lab resides

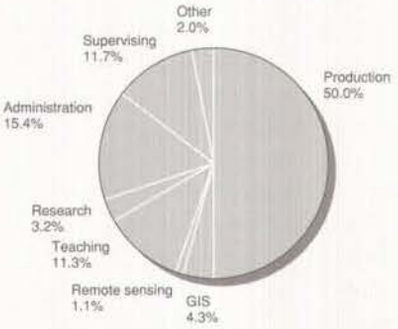

Figure 4: Breakdown of responsibilities: estimate of mean time spent on each

may make outside solicitation problematic. It is a question which needs further exploration.

Despite the fact that few managers are classified as faculty, about 56 percent of those responding indicated that they were invited to participate in faculty meetings, and slightly more than half of those had voting status to at least a limited extent. Seventy-one percent of those participating in faculty meetings were doing some teaching, as opposed to only 28 percent of those not invited to participate. All but one of those with voting status did some teaching.

Budgeting and staff

Slightly more than half of the labs had a budget whose profits or losses rolled over from one fiscal year to the next and about 40 percent of the labs operated with a budget separate from that of any other department.

The number of staff (figure 5) provided in addition to the lab manager is important in that it effects the amount of work that can be performed and shapes the responsibilities of the lab manager. A manager with a staff to supervise will spend more time in an administerial and supervisory capacity and less time in 'hands on' production. Slightly more than two-thirds of the labs had some staff in addition to the lab manager, consisting of some combination of full-time and part-time persons. Part-time staff can be graduate students, undergraduates (both work-study and non-work-study), and occasionally non-student personnel. The average number of employees in addition to the lab manager for all labs was 2.5. This figure was however, somewhat skewed, as two labs reported ten and eleven employees

respectively. Only five labs responding (12.5 percent) had at least one full-time person besides the lab manager. Fifty-eight percent of labs utilized student assistance. Forty-two percent had graduate student assistance and 51 percent used undergraduates.

Clientele and billing

Cartography lab clientele (figure 6) included the resident geography department, other university departments, and non-university persons or businesses. All labs did work for their geography departments, and six labs (14 percent) did so exclusively. Thirty-seven labs (86 percent) did work for other university departments, and 65 percent for non-university clients. On average, 57 percent of clients came from geography, 28 percent from other university departments, and 15 percent from outside the university.

Billing policy for work performed varied considerably from lab to lab. Charges varied according to type of client (whether geography personnel, non-geography personnel, student or non-university), type of funding (grant-supported or not), the experience level of the staff member doing the work; and type of task. Fifty-one percent of respondents specifically mentioned that their billing policy reflected the type of client. Fully one-quarter of the labs responding indicated that they never charged for labor, and 23 percent that they did not charge for materials. Of those labs that did charge for labor, hourly rates ranged from a low of $7.65 per hour to about $20 per hour. One lab charged $40 per hour for work for non-university clientele. Not surprisingly, highest rates were charged to non-university clients. Frequently, geography department staff were not charged or were charged the minimal rates.

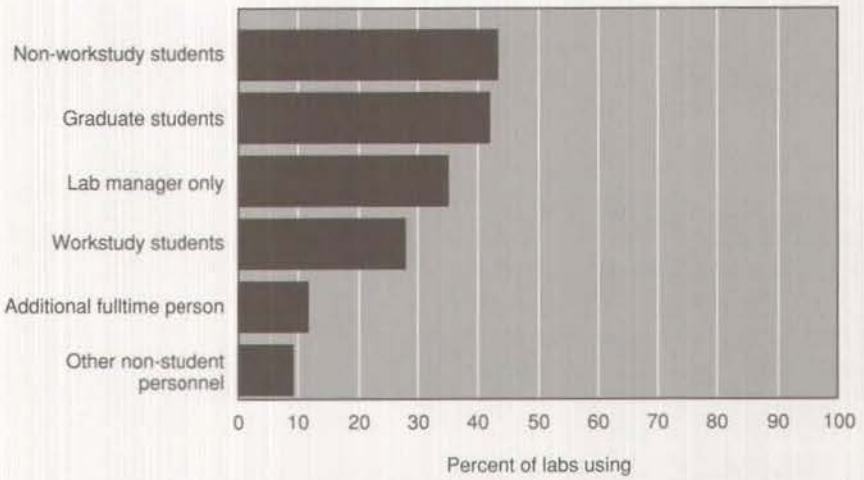

Figure 5: Staffing resources

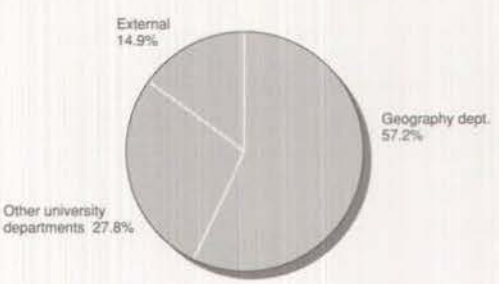

Figure 6: Mean clientele breakdown

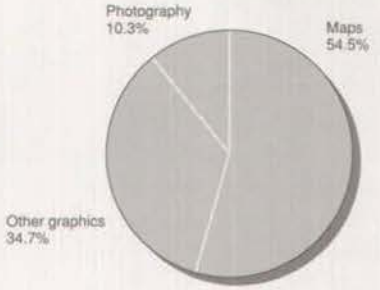

Figure 7: Mean product breakdown

Products

About 55 percent of cart lab products (figure 7) were maps while 35 percent were non-map graphics. The remaining percentage consisted of photographic products (photostats, slides, etc.) About 80 percent of the products were produced by conventional (manual) methods. Less than 20 percent were produced using automated methods (figure 8). Of the 80 percent produced conventionally, 70 percent were done with pen and ink and about 30 percent were scribed. Of all graphics produced, over 80 percent were rendered in black and white and less than 20 percent in color. About 45 percent of the labs were able to produce halftones. Only about 15 percent of the total production time was spent on data collection and analysis as opposed to 85 percent devoted to production. Mechanical lettering methods were chosen about 6 percent of the time. Machine produced lettering was utilized an average of 29 percent of the time and dry transfer lettering 5 percent. Hence approximately 40 percent of the time a manual lettering method was used. Some form of phototypesetting was used about 38 percent of the time and computer produced type was a solution approximately 23 percent of the time. Although almost 50 percent of the labs had access to a microcomputer, only about 23 percent were using it to produce lettering. Most labs have several lettering techniques at their disposal. Of the labs that used only one lettering method, approximately 12 percent used an in-house typesetter and about 7 percent used microcomputer-generated type exclusively. More than 60 percent of the labs did some color proofing and the most used proofing techniques were Kwik-Proof and 3M's Color Key.

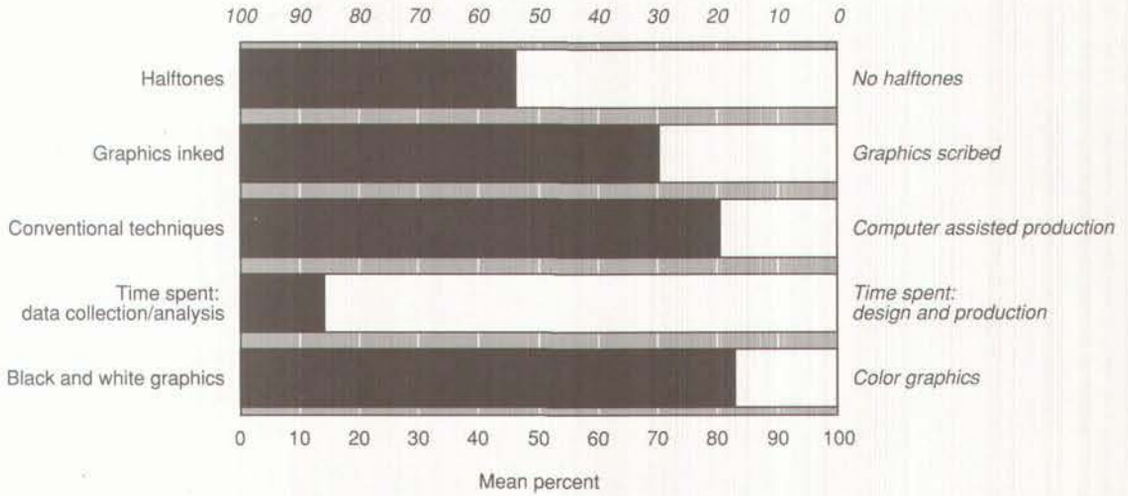

Figure 8: Production Options

Conventional production equipment

Most of the labs surveyed appeared to be well equipped with conventional production equipment (figure 9). Over 80 percent had a copy camera, a vacuum frame, and a projection device — such as a Map-O-Graph — for scaling artwork and over 67 percent had point light sources or platemakers, scribing equipment and 35mm cameras for producing slides or other photographic products. Almost 40 percent had access to phototypesetters, though from the data previously presented it appears that few labs actually utilize them. With the data collected it is possible to estimate (albeit in rough fashion) the capital outlay for the conventional production equipment for a basic cartographic laboratory (table 1).

Computer equipment

Perhaps one of the more exciting aspects of modern cartography and graphic arts is the on-going application of automation. The survey indicated (figure 10) that 60 percent of the labs had access to an IBM or compatible PC and over 40 percent to an Apple or Macintosh machine. Over 50 percent had color monitors, plotters, and digitizers and more than 25 percent had scanners. These

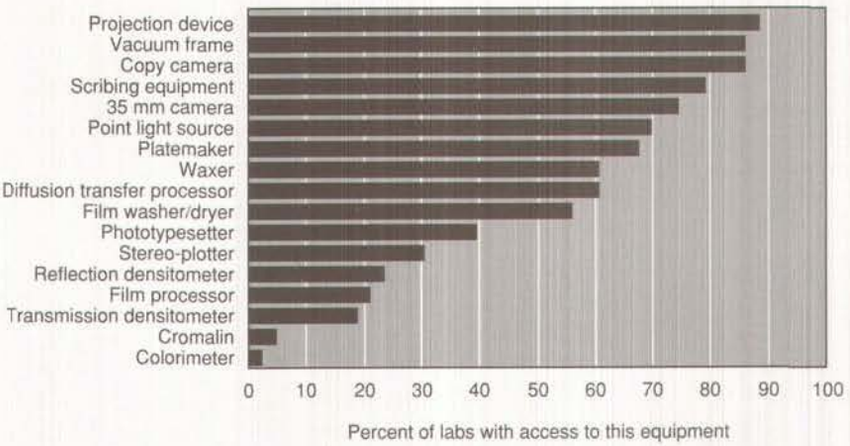

Figure 9: Conventional production equipment

ITEM	COST
Projection device	$ 3,500
Vacuum frame	2,000
Copy camera	5,000
Scribing equipment	1,000
35mm camera, copy stand	1,000
Point light source	400
Platemaker	4,000
Waxer	750
Diffusion transfer processor	750
Film washer/dryer	1,000
Lettering equipment	2,000
Lab furniture	5,000
Misc.	4,000
TOTAL	$30,400

Table 1: Cost estimate for conventional cartographic lab

figures are particularly interesting in light of the fact that less than 20 percent of the graphics produced in the labs were done by automated means. In general, the labs appear to possess the necessary hardware to produce a significantly larger percentage of their graphics via automated methods. The low percentage reported may reflect either an absence of applicable software, a lack of expertise, or perhaps a lack of capital.

Conclusions and prospects

We conducted our survey to more clearly understand the nature and function of academic cartographic laboratories. The data we collected indicates that cart labs are characterized by as much variation as similarity. Lab manager classification, status, and responsibilities vary considerably. Some labs function as a service to an individual academic department while others are viewed more as small

businesses residing within a university community. Those that administer cart labs need to consider carefully the function of the lab within the university setting. Is it a service department akin to a library or computer center, whose primary functions are to provide hands-on experience for students and low cost graphics in support of faculty research, or is it a self-supporting business? In the latter case especially we recommend that lab managers compare the pricing levels of local graphic artists for comparable products and set more competitive billing policies. We do feel that in general cart labs are underselling their services and that until more reasonable billing policies are generally adopted cart lab managers will not be accorded the recognition which their academic training and skills would seem to warrant.

Since we sent out our questionnaires tremendous changes have occurred in the availability of graphic software and hardware that is certain to have a substantial impact on the cart lab. Desktop mapping as described by Mattson (1989) in an earlier issue of this journal clearly has advantages, both in cost and in quality, that will undoubtedly attract the attention and influence the decision-making of cart lab managers in the future. Conventional production techniques for producing small-format maps will be supplanted by automated desktop mapping techiques. Cart lab managers will have to face the issue of whether or not to maintain their darkrooms which desktop mapping renders practically obsolete. Conventional production techniques as well as darkrooms will continue to be cost-effective for larger format maps (i.e. those over 11 by 17 inches) until size constraint are no longer a limitation. In general, desktop mapping will force lab managers to decide which services are essential and cost-effective and will greatly influence which mix of skills will be required for future cart lab managers. ℗

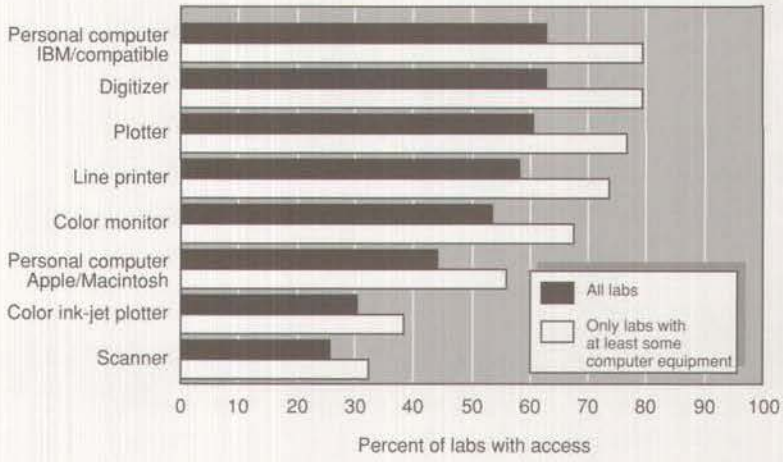

Figure 10: Automated equipment

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compiled by Ellen R. White, Michigan State University

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