

International Trade and Job Creation in Southern California: Facilitating Los Angeles/Long Beach Port, Rail, and Airport Development

Steven P. Erie, with the collaboration of Harold Brackman, James E. Rauch

THE IMPORTANCE OF EXPANDING SOUTHERN CALIFORNIA'S GLOBAL GATEWAYS

Revitalizing the slowly rebounding Los Angeles area economy remains a vexing policy challenge. During the 1990-93 recession, Greater Los Angeles was the hole in the national bucket. Twenty-seven percent of the total U.S. job loss occurred in the five-county metropolitan area (which consists of Los Angeles, Orange, Ventura, San Bernardino, and Riverside counties). The region was California's hole as well: A staggering 75% of the state's recessionary job losses occurred in Los Angeles County alone. Despite recent signs of regional recovery, unemployment rates in Los Angeles, San Bernardino, and Riverside counties in mid-1996 remained 50% above the national average.

For the Los Angeles region, global trade represents one of the most promising routes of economic revitalization and restructuring. With \$207 billion in international trade in 1995, the Los Angeles Customs District has surpassed its New York counterpart as the nation's leading trade center. More than 25% of Greater Los Angeles's gross regional product of \$430 billion -- representing the world's eleventh-largest economy -- now depends on international trade, up from 13% in 1972. In 1996, Los Angeles's global trade is predicted to rise by 14%.

With international trade -- along with the motion picture and television industry -- spearheading the region's recovery, what can state policy makers do to accelerate trade growth and job creation? The state's policy leverage appears limited. Conventional wisdom holds that trade flows are driven by international trade agreements and currency markets, national trade and fiscal policies, and corporate sourcing decisions rather than by state and local policies.

Yet state and local policy makers may have considerable leverage over trade flows that extends beyond California's strategic Pacific Rim location, the size of its domestic market, and the state's marketing efforts. Little appreciated is the economic stimulus provided by the state's superior import/export infrastructure, which facilitates the movement of global goods through the regional, state, and national economies. When California's international ports and airports are factored into the equation, state and local policy leverage over trade flows is measurably enhanced.

Nowhere is this more evident than in the Los Angeles area -- location of the nation's leading Pacific Rim gateways. The ports of Long Beach and Los Angeles are the nation's top two container ports; combined,

they are the world's third-largest container facility. Los Angeles International Airport (LAX) is the nation's second-largest -- and the world's third-busiest -- air cargo facility. Because of San Diego's limited port and airport facilities, Greater Los Angeles's global gateways serve California's trade needs from San Luis Obispo to the Mexican border. In 1995, nearly two-thirds of the state's total international trade passed through these facilities.

By furnishing convenient and direct access to global markets, the Los Angeles/Long Beach ports and airports are a major reason why trade plays such a significant role in the regional and state economies. Global trade promises to play an even greater role in the future. In the next 10 years, up to 60% of the world's economic growth is projected to occur in East Asian countries -- the state's chief trading partners. As a result, California's leading trade portals face a doubling, and perhaps even tripling, of demand over the next 25 years.

Yet looming capacity constraints threaten to act as bottlenecks to trade growth and regional job creation. As a result, local officials are at work on ambitious port, rail, and airport projects designed to dramatically increase the flow of trade and new jobs into the region well into the early twenty-first century. Timely completion of these projects, however, remains uncertain.

RESEARCH OBJECTIVES AND METHODS

This study examines Southern California's three largest trade-related infrastructure projects, evaluates their economic benefits to the region, identifies the challenges to completion they face, and recommends state policies to facilitate their timely completion. These projects are (1) the \$4 billion program of Los Angeles and Long Beach port development, 1995-2020; (2) the \$2 billion Alameda Corridor rail and truck project, 1995-2001, designed to facilitate the movement of goods from the ports to the downtown railheads; and (3) the LAX Master Plan and projected multibillion dollar outlays, 1995-2015, for new facilities at LAX and Ontario International Airport.

For 1996-2000, estimated spending for the region's port, rail, and airport projects is \$4.3 billion. This excludes LAX Master Plan improvements, which are unlikely to begin before the year 2000. Even so, this represents the largest five-year capital spending program for trade-related infrastructure of any metropolitan area in the nation.

This study's objectives are fourfold:

- (1) To summarize the history and current status of each of these projects.
- (2) To offer an evaluation of the need for each project and its regional economic benefit. Given budgetary and timeline constraints, our evaluation involves a re-analysis of the methods, data, and assumptions of existing project demand forecasts and impact studies. In terms of regional impacts, we focus on the five-county Los Angeles metropolitan area, which represents one-half of the California economy.

(3) To analyze each project's prospects for completion, highlighting the major challenges -- financial, environmental, and political -- to timely implementation.

(4) To recommend state policies to meet these challenges and facilitate project completion. While local authorities oversee these projects, state actors enjoy some authority. In addition to the legislature, we focus on the six state agencies with the greatest policy leverage over port, rail, and airport development: the California Transportation Commission, Department of Transportation (Caltrans), California Coastal Commission, State Lands Commission, California Air Resources Board, and California Public Utilities Commission. Because our concern is with transportation projects, and not trade development per se, the state's World Trade Commission is not included.

Besides recommending how state policy makers might serve as project facilitators, we use the three case studies to evaluate state policies regarding trade infrastructure development and to suggest new approaches. There is widespread concern that current policy and funding priorities are inadequate to the challenges of global competition.

Two key assumptions guide this study. First, we assume that all three projects ultimately will be completed. Thus we neither address whether the projects should have been undertaken nor evaluate alternative goods-movement solutions. Second, we presume existing project governance arrangements. The Los Angeles/Long Beach ports and airports are quasi-independent municipal departments with separate budgets. The Alameda Corridor Transportation Authority was created by a joint-powers agreement between the cities of Los Angeles and Long Beach. Critics charge that independent single-purpose agencies such as these distort regional policy and funding priorities, and that all funds should be put "on the table" during planning and budgeting. Yet goods movement historically has been a low regional priority. Existing project governance arrangements promote long-term capital investment, trade, and job growth by preventing undue local political interference.

Methodologically, the centerpiece of this research consists of interviews with over 50 knowledgeable public officials, business people, and community leaders involved with these projects. This represents one of the largest studies ever conducted of infrastructure decision making in California. We also analyze past studies of the region's economy, trade patterns, and port, rail, and airport projects. The research was conducted from August 1994 through September 1995, with an update provided through June 1996.

FINDINGS AND POLICY RECOMMENDATIONS

This study highlights the vital importance of the Los Angeles/Long Beach port, rail, and airport projects to the region's future growth. While past project studies may have overestimated regional economic impacts because they failed to include substitution effects -- the use of other ports and airports by importers and exporters -- these effects are mitigated by the distance to and constraints on alternative facilities, such as in the Bay Area.

We use the Regional Economic Models, Inc. (REMI) and Southern California Association of Governments (SCAG) input/output models to project future regional job growth. Based on the REMI model, we estimate that roughly one-fifth of metropolitan Los Angeles's overall projected 3.6 million new jobs, 1994-2015, depends on timely completion of these projects. Using the SCAG model, we estimate that one-quarter of the region's projected 4 million new jobs, 1994-2020, in its core economic base (consisting of professional services, transportation and wholesale trade, diversified and high-tech manufacturing, tourism and entertainment, and defense- and resource-related employment) depends on building a superior twenty-first century port, rail, and airport system. Because of limited facilities and modest improvement plans, San Diego's trade and job growth also depend on timely completion of these projects.

Given their regional significance, these three projects should be among the state's top development priorities. Yet state agencies have limited authority to facilitate timely project completion. While the state has regulatory oversight over ports, its powers are negative. State regulators can prevent unlawful revenue transfers or veto environmentally damaging projects. Except for ground-access projects (e.g., highways and rail lines), the state has limited power to expedite port development. Little state transportation money is earmarked for intermodal projects like the Alameda Corridor. (Intermodalism involves the use of more than one mode of transport -- vessel, aircraft, rail, or truck.) The state also has little responsibility for commercial aviation, unlike its oversight of general aviation. The state's commercial aviation role is confined to ground-access projects and air-quality regulation.

Given the importance of international trade to the regional and state economies, and the state's limited ability to facilitate port, rail, and airport development, *this study's chief recommendation is that California, in conjunction with regional transportation planning agencies (RTPAs), needs to develop a funded goods-movement policy and regional freight master plans to better promote trade, airport and seaport expansion, improved ground access to the ports and airports, and intermodal rail projects.* This is a particularly critical time to rethink state policy, given pressures to devolve decision making to RTPAs. Goods-movement policy development in Seattle/Tacoma offers a promising model of state/regional cooperation.

The following sections provide detailed findings and policy recommendations for each of the three projects.

Los Angeles/Long Beach Port Development

Status. San Pedro Bay port development is on schedule, but challenges remain. Of the three projects surveyed, port expansion is the furthest along. Begun in the mid-1980s, the ports' long-term development program extends to the year 2020. Since 1991, however, the two ports have pursued different expansion strategies. Long Beach is redeveloping existing properties, such as the Navy station and former Wilmington oil field. The port also hopes to build a container terminal at the Naval Shipyard, which is scheduled to close in late 1997. Port officials claim that their landside approach is cheaper and faster than dredge-and-fill development and reduces environmental review delays.

With fewer landside development options, Los Angeles is working on dredge-and-fill projects in partnership with the U.S. Army Corps of Engineers. While Los Angeles has experienced permitting delays, port officials believe that their Pier 300/400 Implementation Program will meet the scheduled completion dates of 1997 and 2010.

Benefits. Previous studies claimed that the regional benefits of port activity and expansion are substantial. In 1987, before the recession, port-related activities reportedly accounted for 7% of the gross regional product and 363,000 jobs. By 1994, as economic recovery began, port officials claimed that the ports generated 500,000 local jobs. Most of the putative job growth has occurred among port users -- businesses making significant use of the ports for shipping or receiving goods. Proximity to the ports allows exporters and importers to lower their transportation costs and increase shipping reliability. In an era of just-in-time production and delivery, cost and reliability advantages make a significant difference when deciding whether to locate in the metropolitan area or not.

These studies estimated that port expansion to the year 2020 -- designed to handle a 250% cargo increase -- could create up to 15,000 construction jobs and 700,000 new port industry, tenant, and user jobs in the region. Yet these estimates may be inflated because substitution effects were not taken into account. Port planners are improving their estimates of port economic impacts as well as their cargo forecasts -- both of which are major drivers of port expansion.

Challenges. The ports face two major obstacles: pressures to transfer revenues to municipal coffers, and a growing landside transportation bottleneck. The ports have overcome two recent challenges: state-authorized revenue transfers to municipal general funds (SB 844), and stiff federal regional air-quality standards and emissions fines proposed for shippers (the Federal Implementation Plan [FIP]). Although the two ports transferred \$90 million under SB 844, the two-year legislation was not renewed. Strenuous lobbying by California officials and business groups resulted in the FIP's elimination.

Despite the non-renewal of SB 844, the City of Los Angeles has continued sizable port revenue transfers above and beyond traditional service charges. Based on the city's Nexus study, which examined port contributions to the general fund, Los Angeles has substantially increased port billings for city-provided services such as fire protection.

Revenue transfers threaten the ports' ambitious capital programs. Transfers reduce pay-as-you-go financing and force greater reliance on debt, driving up capital financing costs. If they are forced to absorb higher financing costs, shippers could divert discretionary cargo -- representing 40% of containerized cargo moving through the ports -- to other West Coast ports.

The second major challenge is growing rail and truck congestion between the ports and the downtown railheads. The Alameda Corridor project, designed to improve ground access to the ports, is integral to port expansion plans. Failure to complete the corridor could result in efforts to divert discretionary cargo to less congested ports.

Policy Recommendations. While there is little apparent need for major new state policy initiatives in this area, state decision makers can facilitate Los Angeles/Long Beach port expansion in the following ways:

(1) The legislature needs to firmly signal its intention not to reenact SB 844. Revenue diversion pressures on the state's ports remain intense. In the absence of a firm legislative commitment to non-diversion, the ports will make themselves a less attractive target by deliberately keeping their cash reserves low. This forces greater reliance on debt financing, thereby driving up project costs.

(2) The State Lands Commission and the attorney general, under the Tidelands Trust, need to carefully scrutinize municipal claims on port revenues. The State Lands Commission and the attorney general, as the state's legal advisor, are charged with enforcing the Tidelands Trust and the prohibition against gifts of public monies to municipal corporations. Based on the Nexus study, the Port of Los Angeles has been charged \$80 million for alleged city-service underpayments. Citing Tidelands Trust violations, the State Lands Commission has sued the City of Los Angeles to recover transferred port funds. State regulators should be encouraged to aggressively enforce public trust obligations, given the economic significance of California's ports and their capital improvement programs.

(3) The California Coastal Commission needs to re-evaluate its port permitting process. While new legislation has created a *de minimus* review process for port Master Plan amendments, one remaining issue is whether the Coastal Commission applies the Coastal Act uniformly to ports with different development needs. In particular, the commission should consider whether its permitting process unduly handicaps ports like Los Angeles and Oakland, which must heavily rely on dredge-and-fill development.

(4) If the siphoning of port funds continues, the state legislature may need to rewrite harbor commission selection procedures and duties. The legislature may need to resolve the growing conflict of interest among harbor commissioners between meeting their Tidelands Trust responsibilities and implementing the revenue-sharing policy agendas of the local elected officials who appointed them. Resolving this conflict will not be easy. Legislation rewriting harbor commission duties and selection procedures will be attacked as an unwarranted state incursion on the historic home-rule protection afforded charter cities such as Los Angeles. Yet the state's Tidelands Trust duties are legally paramount, and the legislature, along with the Lands Commission and the attorney general, must find ways to ensure that they are adhered to.

The Alameda Corridor Project

Status. The Alameda Corridor, at \$2 billion the nation's largest intermodal project, is designed to facilitate rail and truck access to and from the ports of Los Angeles and Long Beach while mitigating such adverse aspects of port growth as traffic congestion and air pollution. The project will consolidate over 90 miles of rail lines intersected by 200 at-grade road crossings into a single uninterrupted 20-mile high-speed grade-separated rail system linking the ports with the downtown railheads. The double-track corridor will be used by all three railroads serving the ports. Plans also include a continuous at-grade

parallel drill track to serve local industries. The project is designed to allow for future electrification of the rail line. Plans provide for widening and improving Alameda Street, which parallels the rail corridor, to expedite port truck traffic.

Because of delays in finalizing the right-of-way agreement with the railroads, construction did not begin until 1995. The target completion date is now 2001. Port rail traffic is forecast to grow from 29 trains per day in 1991 to 97 in 2020. Given containerization growth and a growing share of port cargos heading to the East, there likely will be greater rail demand than forecast. This makes timely completion of the project even more urgent.

Benefits. In conjunction with port expansion, the corridor promises substantial economic benefits. Previous studies estimated that 700,000 new regional jobs will be created by the tandem port and rail projects by 2020. These estimates may err on the high side, however, because they do not include substitution effects. Even including such effects, sizable regional job benefits remain, such as 10,000 construction jobs that could be targeted at local contractors and workers.

Yet public officials in the six cities along the corridor route -- many with low-income, minority populations and high unemployment rates -- are concerned about the project's dispersed benefits but concentrated costs. They believe that the project is too focused on creating national and regional, but not local, jobs. They also worry about bearing the environmental and economic costs of consolidating rail and truck traffic through their communities. These concerns have led to corridor-city lawsuits to mitigate the adverse impacts of port expansion and ensure greater community control over project decision making.

What is now needed is a comprehensive development plan for the corridor cities. Failure to meet their development needs could result in more conflict and project delays. Particularly needed are mechanisms to acquire and recycle older industrial land along the corridor and perform cost-effective environmental clean-up.

Challenges. Until recently, funding was the biggest challenge to the corridor's completion. While local sources -- the ports, shippers, and railroads -- promised to contribute more than \$1.2 billion of the project's total cost, an \$800 million shortfall remained. Making up the shortfall has not been easy. There are limits on how much user fees can be raised, and state funding is limited by budget shortfalls and competing priorities.

Accordingly, the Alameda Corridor Transportation Authority has focused on obtaining federal funding. Despite the project's national economic importance and inclusion as a "nationally significant corridor" in the National Highway System Designation Act, federal funding has been slow coming because of budget-cutting pressures. Reflecting California's importance in an election year, however, both the president and the House of Representatives have approved a \$400 million project loan guarantee for FY 1997. Senate passage is expected.

Policy Recommendations. Despite state funding shortfalls, and the likely prospect of federal loan guarantees, California policy makers can assist timely completion of intermodal projects like the Alameda Corridor in the following ways:

(1) *The California Transportation Commission and Caltrans need to amend the State Transportation Improvement Program (STIP) to advance project funding.* The California Transportation Commission and Caltrans should consider amending the 1996 STIP to allow for reprogramming and advancement of \$47 million in Flexible Congestion Relief and intercity rail funds for needed projects.

(2) *Despite pressures to devolve decision making to RTPAs, the California Transportation Commission has important policy roles to perform.* These include developing a state goods- movement policy that encourages intermodalism, promoting projects of statewide significance, and ensuring regional cooperation. The State Highway Account does not allow direct funding of rail cargo projects like the Alameda Corridor. The California Transportation Commission and the legislature need to develop a goods-movement policy that allows funding for intermodal projects and better integrates state and federal funding sources. Such a policy could facilitate the next phase of rail access to the San Pedro Bay ports -- the Eastern Corridor project. The Alameda Corridor is only the first half of a rail-freight express corridor through the entire region; the rail line from downtown Los Angeles to Colton/San Bernardino and then over Cajon Pass, is nearly as encumbered with local grade crossings and cross-traffic as the Alameda Corridor is. The Eastern Corridor represents another multibillion dollar investment.

If policy-making devolution does occur, the California Transportation Commission will need to monitor regional transportation planning agencies (RTPAs) to ensure priority status for projects of statewide significance. While devolution enhances funding certainty to RTPAs and reduces regional competition, RTPAs like the Southern California Association of Governments (SCAG) should be encouraged to develop a substantive rather than process orientation to goods-movement issues. One priority is the creation of a Southern California freight master plan. Empowering SCAG subregions could further balkanize regional planning, threatening projects of statewide significance. This makes state monitoring even more imperative.

(3) *The California Infrastructure Bank is a promising funding vehicle for intermodal projects.* In June 1996, California was selected as part of a federal pilot program of state infrastructure bank funding. While the total amount of federal transportation funding to California does not increase, the plan gives state officials more leverage to finance intermodal projects by offering loans or lines of credit. State officials need to explore innovative ways of providing state funding for the infrastructure bank. For example, the legislature could designate State Highway Account funds left over from project construction savings. While funding for the state bank may come too late for the Alameda Corridor -- already saddled with revenue bonds and loan guarantees -- it could serve as a vehicle for other intermodal projects such as the Eastern Corridor or the reopening of the San Diego and Imperial Valley rail line.

(4) *The legislature also needs to consider the potential negative effects on Alameda Corridor funding of using local transit funds to bail out Los Angeles County.* The Los Angeles County Metropolitan Transportation Authority (LACMTA) has become a major conduit of corridor funding. LACMTA has identified and programmed funding sources for \$129 million out of the \$350 million currently included for the Alameda Corridor in its long-range financial plan. To date, however, there is no full funding agreement between LACMTA and the Alameda Corridor Transportation Authority.

In 1995, the legislature approved the transfer of \$150 million in LACMTA funds to fiscally strapped Los Angeles County. Transfer pressures remain intense, and future revenue diversions could affect Alameda Corridor funding. When next facing the issue, lawmakers need to consider the trade-offs between short-term fiscal relief versus long-term job creation offered by investments in projects like the Alameda Corridor. Pending completion of a full funding agreement, state-mandated transfers should be curtailed.

Los Angeles and Ontario International Airport Expansion

Status. Airport expansion is the regional project furthest from completion. Because of planning delays, there are looming facility shortfalls at Los Angeles International Airport (LAX), the state's only true international airport south of the Bay Area. The LAX Master Plan, designed to guide development to the year 2015, will not be completed until early 1998.

An overcrowded LAX faces burgeoning passenger and air cargo demand, primarily international. By 2015 LAX is projected to serve 98 million annual passengers -- nearly a 100% increase over the present -- and air cargo is expected to increase by 140%, to 4.2 million tons. By 2000, there could be shortfalls of at least 29 passenger gates and 82 acres of cargo area.

While the "peace dividend" furnishes Southern California with several new airport options -- Norton, El Toro, George, March, and Point Mugu military air bases -- LAX will remain the region's international airport for the near-term future. Upon completion of a \$300 million terminal expansion program, Ontario International Airport could resume limited international service but will chiefly serve as a regional airport for domestic passenger and cargo service. Given LAX capacity constraints and Ontario Airport's air-quality ceiling, however, other airports must be developed to serve future regional growth.

Benefits. Recent Master Plan analyses show the substantial regional benefits of LAX activity and expansion. LAX now accounts for \$43 billion in economic activity -- 10% of the region's gross product -- and supports nearly 400,000 jobs in the five-county area. If LAX can be expanded to meet projected 2015 demand, an additional 370,000 regional jobs could be generated, as well as \$37 billion in new economic activity. These recent estimates correct for modeling and data errors in previous studies. As for Ontario Airport, the most recent study estimates that in 1990 it generated 55,000 jobs and \$5.4 billion in regional economic activity.

The regional benefits of LAX expansion promise to be as great, if not greater, than for San Pedro Bay port expansion. Airborne exports add more in value to the economy than do waterborne exports. High-

technology, high-value-added manufactured products are especially conducive to air export. Airborne exports also include services, which account for one-quarter to one-third of the region's total trade activity. Service exports are especially important to rapidly growing industries such as tourism, entertainment, and professional/business services.

Challenges. There are major challenges facing LAX expansion. One potential barrier has been eliminated: the Federal Implementation Plan. Master planners, however, confront severe constraints on air space, facility layout (land, runways, and taxiways), and ground access. Environmental mitigation could also prove expensive.

Financing is another looming challenge. While no official LAX Master Plan cost estimates have been made, unofficial estimates are in the multibillion dollar range. The City of Los Angeles has aggressively sought to transfer airport revenues to the general fund, but such transfers increase the debt needed to fund Master Plan improvements. Debt reliance is further increased by the decision not to accept federal grant money for LAX capital improvements so that concession revenues -- a major moneymaker -- might later be transferrable to the city's general fund.

Policy Recommendations. Of the three regional projects examined, the state faces its greatest policy challenge in airport development. Despite the statewide significance of international airports such as LAX, the state has limited authority over commercial airport development. Nonetheless, state policy makers can facilitate such development in the following ways:

(1) State agencies need to fast-track LAX master planning and ground-access projects, as well as Ontario International's expansion plans. LAX faces a looming facility shortfall, while Ontario has limited international facilities and faces air-quality constraints. If LAX is forced to make passenger/cargo trade-offs or limit operations, the California Air Resources Board may need to relax its air-quality ceiling at Ontario to relieve pressures at LAX.

Because of their statewide importance, LAX and Ontario International's ground-access projects need to be given priority status for discretionary funding by the California Transportation Commission. At LAX, key projects include a full interchange at Arbor Vitae/San Diego Freeway, widening of the Sepulveda Boulevard/Century Freeway off-ramp, and MTA Green Line rail extension directly to the central terminal area or to an airport people-mover system at a multimodal transit center.

(2) The state needs to consider expanding its policy role in airport development. One possibility is to oversee military base reuse/joint use for commercial aviation. The federal government has closed or realigned Southern California military bases. Reusing these facilities could significantly reduce international and air cargo pressures at LAX and Ontario. A more proactive state role might include the following: legislation to bar non-aviation use of closed military air bases, pending evaluation of their conversion potential; a statewide feasibility study of joint use and reuse; and an expanded charter for the Department of Transportation's Division of Aeronautics. SCAG's joint-use/reuse feasibility studies of the Point Mugu and March bases serve as useful models for California military base conversion.

A SUMMARY RECOMMENDATION

The state needs to develop a funded goods-movement policy to better promote international trade, seaport and airport expansion, improved ground access to the ports and airports, and intermodal rail projects. Given the vital importance of global trade to the California economy and the need to expand the state's import/export infrastructure -- as exemplified by the capital improvement plans of the ports of Los Angeles and Long Beach, the Alameda Corridor project, and Los Angeles and Ontario airport planning -- state policy makers and regional transportation planning agencies like the Southern California Association of Governments need to make goods-movement planning and priority funding of intermodal projects central elements of a globally oriented economic development strategy for the twenty-first century.

Steven P. Erie, the project's principal investigator, is associate professor of political science at the University of California, San Diego. He is completing Global Los Angeles: Dynamics of a Developmental City-State, 1895-1996 (Stanford University Press, forthcoming). Harold Brackman, Ph. D., the research coordinator, is a consultant for the Simon Wiesenthal Center. James E. Rauch, the economic analyst, is associate professor of economics at the University of California, San Diego.