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Arizona State Rail Plan

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Foreword

The Arizona State Rail Plan is one piece of a larger multimodal planning framework for the State of Arizona. This document presents a series of issues and opportunities relative to the future of rail development in Arizona, including a series of implementation directions and a discussion on funding options. The technical work to support this document can be found in the Statewide Rail Framework Study, part of a broader 40-year multimodal transportation vision for Arizona. This planning process has spanned the last three years, included intense interagency and public involvement efforts, and was recently accepted by the State Transportation Board as part of the Statewide Transportation Planning Framework Program. Additional information and technical reports can be found at:

http://www.bqaz.gov

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Abbreviations

AA	Alternatives Analysis
AAR	Association of American Railroads
ACC	Arizona Corporation Commission
ADOT	Arizona Department of Transportation
APA	Apache Railway Company
APS	Arizona Public Service
APSX	APS Cholla Power Plant/Palo Verde Nuclear Generating Station Plant Railroad
AZCR	Arizona Central Railroad
ARRA	American Recovery and Reinvestment Act of 2009
ARZC	Arizona & California Railroad
ASARCO	American Smelting and Refining Company
ATSF	Atchison, Topeka, and Santa Fe Railway
AZCR	Arizona Central Railroad
AZER	Arizona Eastern Railway, Inc.
AGFD	Arizona Game and Fish Department
BIA	Bureau of Indian Affairs
BLKM	Black Mesa & Lake Powell Railroad
BNSF	BNSF Railway
BqAZ	Building a Quality Arizona
BRT	Bus Rapid Transit
CAAG	Central Arizona Association of Governments
CBRY	Copper Basin Railway
CMAQ	Congestion Mitigation and Air Quality Management
CTC	Centralized Traffic Control
CWR	Continuous Welded Rail
DOT	Department of Transportation
DSC	Drake Switching Company
DTC	direct traffic control
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FMPO	Flagstaff Metropolitan Planning Organization
FRA	Federal Railroad Administration
FRAC	Freight and Rail Advisory Council
FTA	Federal Transit Administration
FTZ	foreign trade zone
FXE	Ferromex

GCRX	Grand Canyon Railway
GVGN	Gila Valley Globe and Northern Railway
HSR	High-Speed Rail
HUD	Housing and Urban Development
HURF	Highway User Revenue Fund
ICR	intercity rail
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
KCSM	Kansas City Southern de Mexico
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
LRTP	State Long Range Transportation Plan
MAA	Magma Arizona Railroad
MAG	Maricopa Association of Governments
MP	Milepost
mph	Miles per hour
MPOs	metropolitan planning organizations
NAFTA	North American Free Trade Agreement
NEPA	National Environmental Policy Act
PAG	Pima Associations of Governments
PDOX	Phelps Dodge Morenci Mine Industrial Railroad
PFE	Pacific Fruit Express
POLA/POLB	Ports of Los Angeles/Long Beach
PRIIA	Passenger Rail Investment and Improvement Act
PTC	Positive Train Control
RSIA	Rail Safety Improvement Act
RTA	Regional Transportation Authority
SAFETEA-LU	Safe Accountable, Flexible and Efficient Transportation Equity Act: a Legacy for Users
SMA	San Manuel Arizona Railroad
SP	Southern Pacific
SPSR	San Pedro and Southwestern Railroad
SR	State Route
SRFS	Statewide Rail Framework Study
SRP	Arizona State Rail Plan
STFS	Statewide Transportation Framework Study
TCG	Tucson, Cornelia and Gila Bend Railroad Company
TCIF	Trade Corridor Improvement Fund
TEA-21	Transportation Equity Act for the 21st Century

TEP	Transportation Enhancements Program
TEUs	Twenty Foot Equivalent Units
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIGER	Transportation Investment Generating Economic Recovery
TWC	Track Warrant Control
UPRR	Union Pacific Railroad
USDOT	United States Department of Transportation
USG/YVR	Yuma Valley Railway
VRE	Virginia Railway Express
WHSRA	Western High Speed Rail Alliance
YMPO	Yuma Metropolitan Planning Organization

Glossary of Terms

Alternatives Analysis: Alternatives Analysis focuses on a specific transportation need (or set of needs) in a corridor or subarea, identifies alternative actions to meet these needs, and generates the information necessary to select a preferred project for implementation. These activities are often collectively called "alternatives analysis" and address such issues as potential corridors, corridor characteristics, costs, benefits, environmental and community impacts, and financial feasibility.

Amtrak: Trade name of the National Railroad Passenger Corporation, established in 1971 to take over intercity rail passenger service from private railroads that no longer wished to provide such service.

Branch: A rail track which connects into a railroad trunk line. Rules and instructions pertaining to subdivisions apply on branches.

Class I railroad: As defined by the Association of American Railroads, a railroad with an operating revenue exceeding $319.3 million per year. The U.S. has seven such railroads, including BNSF and Union Pacific.

CANAMEX: The CANAMEX Trade Corridor, as defined by Congress in the 1995 National Highway Systems Designation Act, is a High Priority Corridor connecting Nogales, Arizona, through Las Vegas, Nevada, to Salt Lake City, Utah, to Idaho Falls, Idaho, to Montana, to Canada.

Class II railroad: These railroads are considered by the Association of American Railroads as "Regional Railroads" and are typically at least 350 miles in length with more than $40 million in annual operating revenues.

Class III railroad: These railroads are defined as having annual operating revenues of less than $40 million or are switching/terminal railroads. Class III railroads are typically local short line railroads, serving a very small number of towns or industries. Many Class III railroads were once branch lines of larger railroads that were spun off, or portions of mainlines that had been abandoned.

Classification yard: A railroad yard used to separate railroad cars on to one of several tracks, building new trains in the process. Cars are first taken to a track, called a lead or a drill track, and then sent through a series of switches, called a ladder, to the classification tracks. Larger yards tend to put the lead on an artificial hill, called a hump, so that gravity may propel the cars through the ladder. There are three types of classification yards: flat-shunted yards, hump yards, and gravity yards.

Commuter rail: Passenger rail service that operates within a metropolitan area—also called metropolitan rail, regional rail or suburban rail—or between two nearby metropolitan areas (e.g., San Francisco and San Jose). Commuter Rail most often connects a central city with its suburbs, and typically operates on track that is part of the general railroad system.

Deep-water port: Has more than one definition; perhaps the most pertinent is a port capable of accommodating the largest freight container ships that can pass through the Panama Canal.

Division: A geographical unit used by railroads to divide their operations for administrative purposes.

Environmental Impact Statement (EIS): As required by Section 102 of the National Environmental Policy Act; a detailed statements assessing the environmental impact of, and alternatives to, major federal actions significantly affecting the environment. Such a statement is called an EIS.

Flyover: A grade-separated crossing of two transportation facilities, where one line is physically elevated over the other. Also called an underpass or overpass.

Fracture zone: Areas of reduced permeability between habitat blocks.

Greenfield corridor: A corridor, to be used for development/transportation projects, whose previous use (if any) was vacant undeveloped land or agriculture.

Habitat block: An area of land that consists of important wildlife habitat and can reasonably be expected to remain wild for at least 50 years. Habitat blocks are primarily comprised of lands within National Forests, National Parks, National Wildlife Refuges, large military reservations, tribal lands, and lands managed by Bureau of Land Management (BLM) or Bureau of Land Reclamation (BLR).

High-speed rail: A mode that provides frequent passenger service between major population centers typically 100 to 600 miles apart, routinely achieves operating speeds of 110 mph or more, and may use shared tracks if equipped with positive train control (PTC) technology. According to the FRA, "service... is time-competitive with air and/or automobile travel in a given intercity corridor." Top speeds of 125 mph or more generally require completely grade-separated tracks and dedicated right-of-way. The FRA defines three levels of high-speed rail: express (with top speeds of at least 150 mph), regional (with top speeds of 110 to 150), and emerging (with typical speeds of 90 to 110).

Industrial Lead: A relatively short length of privately operated and maintained rail track, originating from a rail line and serving industrial uses.

Inland port: An inland intermodal terminal directly connected by road or rail to a seaport, and operating as a center for the transshipment of sea cargo to inland destinations. In addition to its role in cargo transshipment, it may contain facilities for storage and consolidation of goods, maintenance for road or rail cargo carriers, customs clearance services. An inland port may also be located in a foreign trade zone (FTZ) that contains adjacent land beyond the inland port, often encompassing manufacturing facilities located in close proximity to the port to take advantage of its intermodal transportation benefits.

Intercity rail: Refers to rail passenger service connecting cities approximately 100 miles or more apart. In the U.S., top speeds may range from 79 mph to approximately 90 mph. It generally operates on track shared with freight trains, commuter rail or both.

Intermodal: Refers to the movement of freight by more than one mode of transportation. The railroad industry applies the term to container and trailer on flat car transportation only.

Linkage zone: A portion or subset of the fracture zone or habitat block identified as an area critical to wildlife movement.

Mainline: A railroad's principal trunk route between two points; it usually has sidings, spurs, and yards at a number of locations to serve customers, and to hold freight cars.

Metropolitan area (formally, Metropolitan Statistical Area or MSA): An area that contains at least one urbanized area of 50,000 or more inhabitants. An MSA "central county" has at least 50 percent of its population residing in urban areas of 10,000 or more population, or contains 5,000 or more people living in a single urban area of at least 10,000. An MSA "outlying county" has at least 25 percent of its employed residents working in the central county or counties of the MSA, or has at least 25 percent of its employment accounted for by workers who reside in the central county or counties.

Panamax: Refers to large ships that currently do not fit through the Panama Canal (carrying over 5,000 twenty thousand-foot equivalent units [TEUs]), until completion of the canal's lock expansion project which will accommodate cargo capacity up to 13,000 TEUs.

Positive Train Control (PTC): Refers to technology that can prevent train-to-train collisions, overspeed derailments, and casualties or injuries to railway workers operating within their limits of authority as a result of unauthorized incursion by a train. PTC can also prevent train movements through a switch left in the wrong position. PTC systems vary widely in complexity and sophistication, based on their level of automation, the system architecture, the wayside system on which they are based (e.g., non-signaled, block signal, cab signal), and the degree of train control they can assume. The federal Rail Safety Improvement Act of 2008 mandates the widespread installation of PTC systems by December 2015.

Quiet zone: A segment of track, typically in an urbanized area, in which an agreement between local government and the railroad removes the requirement of sounding train whistles or horns, at least during specified hours. In return, the local jurisdiction may pay for and install additional safety measures, such as grade-separated road crossings or four-quadrant gates to enhance safety.

Section 130: An FHWA-administered program that provides funding to states for use in highway-rail grade crossing safety improvement projects.

Section 403(b): As part of the National Railroad Passenger Service Act of 1970, federal Amtrak legislation allows under Section 403(b) for a state or states to apply to Amtrak to establish rail service within their state(s) if they agree to pay at least 45 percent of the first year operating costs and 65 percent in the years thereafter.

Short line railroad: As defined by the Association of American Railroads (AAR), short lines consist of (1) line-haul railroads operating less than 350 miles of road and earning less than $40 million of annual operating revenue, and (2) switching and terminal railroads, which are either jointly owned by two railroads for the purpose of transferring cars between railroads, or operate solely within a facility or group of facilities.

Subdivision: A railroad division may be divided into a number of subdivisions for ease of operations.

Switch: As a noun, refers to track equipment that allows cars to move, or cross over, from one track to another. The verb refers to shuffling or moving rail cars, usually within a yard (also called marshaling).

Team Track: A rail siding for general usage by freight shippers, named for the teams of horses that once pulled the wagons to fetch the freight.

Trackage rights: An agreement between two railroads whereby one buys the right to run its trains on the tracks of the other.

Train spot: To switch a freight car to a specific location, usually for loading or unloading.

Transit-oriented development (TOD): A specialized case of mixed-use, moderate-to-high-density development that is located within walking distance of a fixed guideway transit stop. The proximity to fixed guideway transit allows for reduced parking requirements; the mixed-use aspect encourages a reduced demand for trips by bringing housing, jobs, community facilities, and goods and services close together so that the need for travel beyond the immediate vicinity is less than in typical developments. TOD developments typically emphasize walkable streetscapes, moderate to high density housing, office, and supporting retail, focused public spaces, and integrated design that offer the ambience of traditional neighborhoods.

Transloading: The transfer of a shipment from one mode of transportation to another.

Value-added: The enhancement added to a product or service by a company before the product is offered to customers.

Wye: A triangular shaped arrangement of railway tracks with a switch at each corner. In mainline railroads, this is used at a railway junction, where two railways join, or cross over. It can also be used as a stub for turning railway equipment. By performing the railway equivalent of a three-point turn, the direction of a locomotive or railway vehicle can be reversed.

Yard: A system of tracks, other than main tracks and sidings, used for making up trains, storing cars or other purposes.

Yard limits: A portion of main track designated by yard limit signs and by timetable, train order Form T or track bulletin, which trains and engines may use.

CHAPTER 1. INTRODUCTION AND OVERVIEW

Arizona has experienced several decades of extraordinary growth, and during that time has built modern, vibrant cities and towns. These cities are built on a foundation of well-planned freeway networks integrated into an extensive roadway system generally organized in a grid pattern that has supported a vehicle dominated transportation system throughout the State. The land use patterns which have developed from these decades of growth has tended to be characterized as suburban development with large, single family home subdivisions separated from commercial and employment centers.

The latest economic downturn has vividly demonstrated that unfocused growth is not the path to stable long-term prosperity. Like all Sunbelt states, Arizona is confronting a serious recession and is faced with limited funding for transportation infrastructure. Transportation investments over the next several decades must be strategically utilized to leverage the maximum economic benefits for the State of Arizona. Investment in rail infrastructure has been demonstrated to provide economic stimulation during the implementation phase, and maximizes benefits through direct linkages with private land development along rail corridors once constructed. This can foster urgent job growth needed for the state to navigate a successful recovery from the current economic conditions.

The highly connected grid of highways and local streets which currently exist in the state represent the first half of an efficient multi-modal transportation system which will support the emerging Sun Corridor Megapolitan, and expanding rural areas. The second half of the system is envisioned to be an integrated transit system designed in harmony with the roadway system, and will include intercity passenger rail, commuter rail, high capacity bus rapid transit, light rail, and street car systems. These multi-modal transportation components will expand the new development models emerging within the state. These new approaches integrate horizontal and vertical mixes of land uses with higher density residential sites, including a wide variety of multi-family building types.

In order to economically compete globally the State will need to provide educated workers, sufficient capital to fund research and entrepreneurs, while nurturing promising new homegrown companies. The recession has awakened a sense of urgency to restructure the economy of our State to attract a more sustainable mix of industries and the jobs they offer. A key cornerstone for creating a sustainable economy is an efficient multi-modal transportation system which can support an additional six million people in Arizona within the next 50 years. A multi-modal transportation system which includes a strong rail component can help to promote a compact land use development pattern in the State of Arizona that could have the following benefits;

1. Save over 800 square miles of open desert and agricultural lands from development
2. Eliminate the need for as many as 30 million miles of driving each day, reducing the amount of greenhouse gas emissions and our reliance on foreign energy sources
3. Provide an estimated savings of over $10 B in transportation capital costs, as opposed to an auto-dominated transportation system.

Arizona's economy needs an efficient and competitive rail network. A healthy rail network must provide a reliable, accessible, and cost effective service to shippers and customers across the State. In addition, a fast, frequent and reliable passenger rail service between population centers and tourist destinations that is competitive with automobile and air travel times, is important to the State's economic and environmental well-being.

1.1 Purpose of the Arizona Rail Plan

In the next 20 years, the State of Arizona will face great challenges in managing and developing its transportation system. With a rapidly growing population and expanding business sector, the transportation network will have to accommodate significant increases in passenger and freight movements.

The reality is that much of this demand will stress an already overburdened highway system, and investment in Arizona's rail system may provide some relief to future highway congestion. There is an opportunity to divert passenger and freight demand from highway facilities to the rail network. Through collaborative planning, Arizona can build a rail system that will move people and goods in a safer, sustainable, and in a cost effective way.

The Arizona State Rail Plan (SRP) is the first comprehensive assessment of the State's rail needs and was initiated in response to the increasing involvement by the Arizona Department of Transportation (ADOT) in freight and passenger rail issues. The SRP serves to identify the current rail system, determine infrastructure needs, and to have rail projects included in the State's long-range planning processes to improve regional and statewide safety and mobility. The principle purpose is to convey the magnitude of rail needs in the State and set forth a policy framework through which strategic actions can be taken to realize the full potential of passenger and freight rail transportation.

1.2 History of Railroads in Arizona

Railroads came to Arizona in the late 1800s and had a profound influence on the development of the State. The cornerstones of early Arizona commerce (cattle, citrus, copper, climate and cotton) would not have been possible without the transportation provided by the railroad industry.

Before the railroad reached Yuma, practically all of the supplies for the State were shipped by steamer from San Francisco down the coast, around Lower California and up the Sea of Cortez to Port Isabel, where the cargoes were shifted to light draft stern-wheel boats, and the journey continued up the Colorado River to points in Arizona. Most of this river traffic was carried by the Colorado River Steamer Navigation Company, which was purchased by the Southern Pacific in 1877.

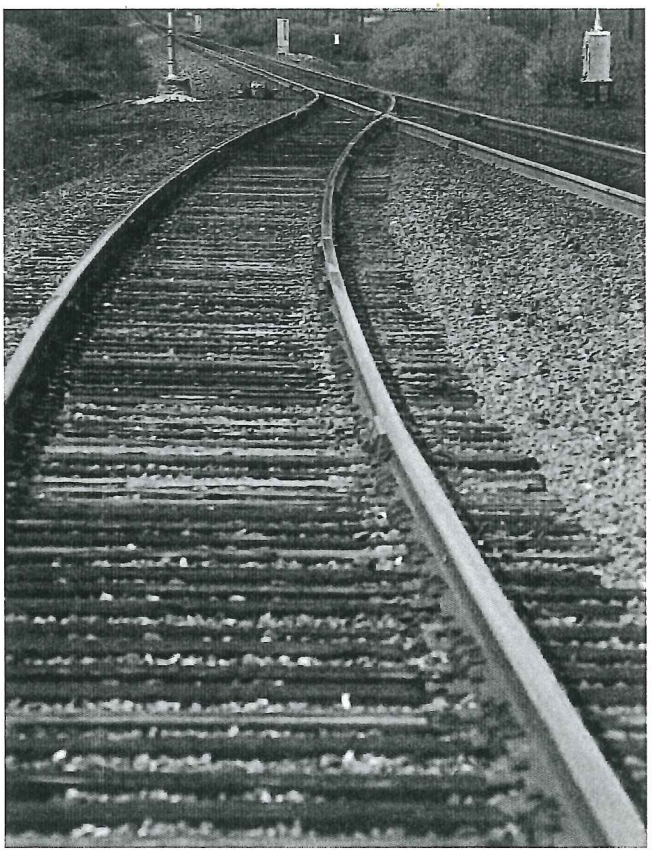
In July 1866, Congress passed a law incorporating the Atlantic and Pacific Railroad, the company was given the mission to build near the 35th parallel from Springfield, Missouri west to the Pacific. In exchange for its completion, the railroad would receive land grants along its route. In 1880, the Atlantic and Pacific Railroad began laying track westward from Albuquerque on its way to California. On August 1, 1882 the railroad reached Flagstaff, and was completed across the State in August 1883. At the time of its completion the Atlantic and Pacific Railroad was a subsidiary of the Atchison, Topeka, and Santa Fe Railway (ATSF). The 209-mile 'Peavine', that connects Williams Junction to Phoenix through Wickenburg, was originally built in 1893-1895 by ATSF, and originally provided service to Prescott. The Peavine has had no passenger trains since 1969, and the Prescott Branch was abandoned in the 1980s. However, the current alignment through Skull Valley is a major freight rail connection between Phoenix and the Transcon Corridor.

The Territorial Act of 1877 called for another main line route to enter into southern Arizona at Yuma, and continue eastward across the southern part of the State into New Mexico at Lordsburg. Southern Pacific (SP) was given the charter for constructing the southern route. By 1879, SP's operations extended from Yuma to Maricopa Wells and later that same year to Tucson. It was another three years before service was opened to Lordsburg. In the early 1900s, the other segments of the historic Southern Pacific system (Phoenix Loop, Nogales, Douglas, Globe, Hayden and Clifton lines) were added. Most of the significant railroading activities occurred at the end of the 19th and the first half of the 20th Century. Few rail development activities occurred in the second half of the 20th Century. The construction of the interstate and defense highways and the increased regulation of railroads, made the automobile the preferred choice for personal mobility and increased the trucking industry's share of freight movements.

The Staggers Rail Act of 1980 is a federal law that deregulated the American railroad industry to a significant extent, and replaced the regulatory structure that existed since the 1887 Interstate Commerce Act. Deregulation provided for the rebirth of railroads by reversing the historic loss of traffic to the trucking industry, and increasing railroad industry profits.

Today, the Arizona rail network provides an important link to the national system. The two Class I railroads in

Arizona, BNSF Railway Company (BNSF) and Union Pacific Railroad (UPRR), facilitate the coast-to-coast movement of various commodities. The two Class I railroads are the result of mergers between the Burlington Northern Railroad and the ATSF, and another merger of SP and UPRR. BNSF, created in 1995, operates 33,500 route miles in 28 states and 2 Canadian provinces. The UP-SP merger occurred in 1996 and the railroad now operates 36,000 miles in 23 states. These railroads provide a "rail-bridge" between California and Midwestern industrial and distribution areas.



In addition, thirteen active regional and short line railroads are located in Arizona. Many serve the natural resource industries, such as mining for which they were originally constructed. These Arizona railroads are addressed more extensively in the following sections of this document.

Until the early 1970s, the two Class I carriers provided passenger as well as freight service in Arizona. Amtrak was created in 1970 via the federal act titled 'Rail Passenger Service Act', and began service on May 1, 1971. Currently, Amtrak operations through Arizona are part of a long-distance, coast-to-coast service which follows the two Class I carrier mainlines through northern and southern Arizona, and represent the existing intercity rail service for the State. In the late 1980s, the tourist railroad industry began operating in Arizona. Currently, Arizona has three tourist railroads.

"The time will come when people will travel in stages moved by steam engines from one city to another, almost as fast as birds can fly. A carriage will start from Washington in the morning, the passengers will breakfast at Baltimore, and supper in New York in the same day." - Oliver Evans, 1800.

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CHAPTER 2. ARIZONA RAIL VISION, GOALS AND OBJECTIVES

2.1 A Vision of Rail Transportation in 2030

A safe, secure, efficient and cost-effective passenger and freight rail network forms an integral part of Arizona's multimodal transportation system. Arizona railroads promote economic opportunities and environmental sustainability that reflect the high value Arizonans place on their unique southwestern lifestyle.

Intercity passenger rail, a new and reliable mode for Arizonans, is well connected to commuter rail and local transit systems. Through coordinated land use decisions and wise investments in multimodal facilities, the State is now a showpiece of compact sustainable growth patterns served by an efficient and seamless transit system. Passenger rail has competitive travel times and is the preferred option for many trips both locally and regionally.

The State has a freight rail system that carries long-distance cargo in an energy-efficient manner, with intermodal connections that permit seamless distribution of local deliveries. A robust economy including a greater proportion of manufacturing and entrepreneurship industries is served by a freight system comprised of both Class I railroads and short line operations.

The Sun Corridor has become a model megapolitan within the United States; the focused growth patterns have preserved much of the desert environment and promoted a lifestyle emulated by the rest of the country. The multi-modal transportation system supporting the state has proven to be a key cornerstone of achieving an economy which supports all walks of life and has attracted employers to the state in new and exciting industries.

2.2 Goals and Objectives

Goal I: Improve mobility and accessibility, create a multi-modal transportation system where the existing roadway network is complimented by efficient passenger and freight rail service.

Objectives:

- Develop safe, reliable and affordable transportation choices that strive to reduce highway congestion, and leverage additional capacity on the State's transportation system.
- Become a catalyst for smart growth community planning that includes multimodal connections and choices, transit oriented development, and economic growth opportunities.
- Improve the efficiency of passenger and freight movements within the State, in partnership with private carriers.

Goal II: Support economic growth, create a passenger rail network which fosters more livable communities that attract new employers to the State, and help enhance the State's global competitive position through strategic freight rail initiatives.

Objectives:

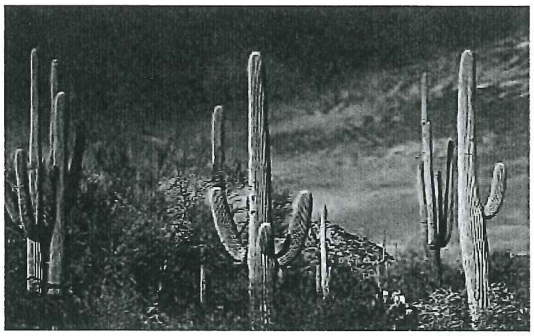
- Support regional, tribal and local economic development plans, priorities, goals, and objectives.
- Support growth of traditional and non-traditional rail-related and rail-supported industries to increase global competitiveness.
- Improve economic competitiveness through reliable and timely access to passenger rail connections between economic and employment centers.

Goal III: Promote sustainable transportation and land use coordination, develop a multi-modal transportation system that enables a compact mixed use development pattern which becomes a sustainable method for accommodating a growing population.

Objectives:

- Improve Arizona's sustainability through coordination of rail transportation, land use, and economic development planning activities.
- Encourage land use patterns connected by multiple modes of travel that support rail and transit access and encourage pedestrian mobility, reduce energy consumption and green house gas emissions, improve air quality and promote public health.
- Foster collaboration between federal, State, regional and local public agencies to plan a seamless multimodal transportation system.
- Planning efforts related to new rail corridors or improvements to existing corridors should be coordinated with local land use plans and the State Land Department conceptual plans to help promote rail as a community asset.

Goal IV: Preserve the environment, natural and cultural resources, move passengers and freight in a socially and environmentally responsible manner which will promote preservation of the State's natural environment.



Objectives:

- Provide seamless and energy-efficient intermodal rail connections from origin to destination.
- Avoid degradation of existing environmental resources, wildlife habitat blocks and movement corridors, and equitably mitigate impacts.
- Protect and maintain wildlife movement corridors.
- Promote rail as an environmentally friendly and sustainable alternative to other modes of travel.

Goal V: Provide safety and security; protect people, cargo, and infrastructure.

Objectives:

- Enhance the safety of passenger movements and connections between major activity hubs within the State and to the national passenger rail system.
- Strengthen the security of freight movements.
- Provide parallel or alternative transportation routes and services to facilitate emergency access, including evacuation.
- Promote energy security by reducing the state's reliance on petroleum products, particularly from foreign sources.

2.3 Benefits of Rail for Arizona

Arizona's railroads have historically played a crucial role in the State's transportation system, and continue to do so today. Passenger rail service, although mostly serving tourists today, could provide an alternative mode of travel for Arizonans in the future, and may help focus growth to achieve more sustainable development patterns enhancing the livability choices within Arizona communities. Commuter rail, conventional intercity rail, and ultimately high-speed rail will all have roles to play in Arizona's multimodal transportation system.

Strategic investments in railroad facilities, related industries and ancillary services can also open new opportunities for economic growth and development. Moving freight by rail is more energy efficient as compared to other modes of travel, and in most cases is at a reduced cost. Capturing a larger proportion of future freight movements on the rail system can help promote a more sustainable economy for Arizona.

Investment in passenger and freight rail infrastructure has been demonstrated to provide economic stimulation. The State will benefit from the engineering and construction activities required to implement improvements to the rail system, and once implemented an efficient rail system will attract corporations and manufacturing industries needed to create a sustainable economy for the future.

2.3.1 Congestion Mitigation

During 2006, railroads carried freight equivalent to more than 12 million truckloads across the country. A typical 100-car containerized unit train is equivalent to approximately 385 freight trucks on the State's highways. Planning for greater freight movements on railroads along multimodal corridors can reduce the cost of maintaining existing roads and the pressure to build costly new ones. Freight rail avoids additional overcrowding on highways, making roads safer and promoting economic growth.

Class I railroad lines run parallel to most major Interstate highways in the State, such as I-8, I-10, I-19 and I-40. These corridors represent multi-modal thoroughfares providing freight movements by rail and truck, and passenger movements by intercity rail, bus and personal vehicles. In general, a class I mainline has an approximate capacity of 216 million annual tons. Assuming rail operations on each mainline at full capacity, the class I railroads in Arizona could move the equivalent of approximately 8.3 million truckloads annually or 23,000 daily. Table 1 compares the capacity of the three principal freight transportation modes in Arizona.

Table 1 - Capacity Comparison for Freight Transportation Modes

Vehicle	Truckloads	Boeing 747 Cargo Aircraft	100-Car Containerized Train
Average Capacity (Tons)	26	124	10,000
Equivalent Truck Units	1	5	385

Source: AECOM 2010

2.3.2 Economic Benefit

Passenger rail can work as a catalyst for more sustainable land use by focusing growth surrounding multimodal transportation nodes while providing cost savings and efficiency gains. Indirect benefits include congestion

reduction, infrastructure cost savings, consumer savings, reduced crash damage, improved air quality and public health. These economic savings and efficiency benefits filter through the economy as savings to consumers, businesses and governments, making a region more sustainable and competitive (Source: Victoria Transport Policy Institute. 2009. Rail Transit in America: A Comprehensive Evaluation of Benefits). Passenger rail can boost the economy by creating direct and indirect jobs, and spur economic growth by making travel between major cities easier.

The economic benefits of rail begin with direct job creation in construction of the rail facilities, while economic growth surrounding a freight distribution center or passenger station create indirect jobs, and finally there are benefits to the broader economy.

Rail facilities require vast amounts of labor to create, from professional services to pouring of concrete and laying of rails. The biggest source of job creation is in the actual construction of the rail system. At the peak of construction the Channel Tunnel, linking England and France together, employed over 10,000 workers just on the English side of the project. Hong Kong's high speed rail line is projected to create over 5000 jobs during construction and another 10,000 during the operation phase.

Passenger Rail station locations bring with them the potential for economic development serving as an attractive location for stores and offices. A passenger rail station is envisioned to raise property values in the near vicinity, by creating a bustling and economically vibrant part of a community.

Freight distribution centers attract rail served companies which tend to employ large numbers of people in manufacturing and fabrication industries. Arizona's vision of a new economy including a vibrant renewable energy sector, aerospace and defense, and technology can provide numerous industrial opportunities which would be attracted to efficient rail service.

Recent research suggests that the non-transportation economic benefits of rail investments are as important as the transportation benefits received from construction of the system. Passenger rail and other rail investments put more people and businesses in closer connection to one another with potentially significant gains in productivity. Economists have long studied the gain in productivity that result from concentrations of industries or people, which shows that industries benefit in many ways from locating near other similar businesses, which is envisioned surrounding freight rail logistic centers or transit nodes.

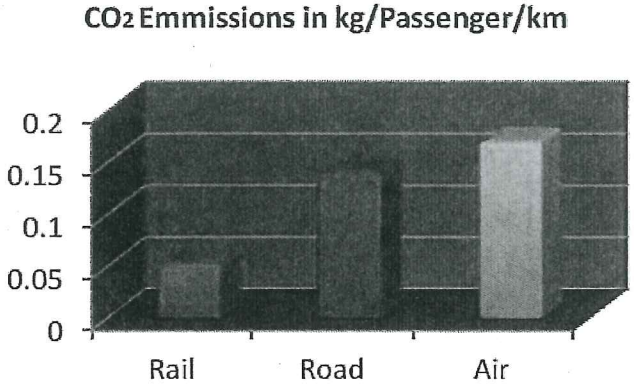
2.3.3 Air Quality

Of all modes of transportation, railroads cause the least air pollution per unit of freight carried which can reduce the amount of green house gas emissions within the state and improve public health. Aircraft take-offs and landings require a large amount of fuel, producing high emissions of CO2 per passenger. A train uses up to 70 percent less energy and causes up to 85 percent less air pollution than a jet aircraft. Intercity trains provide similar benefits to the environment compared to the equivalent journey by automobile (Figure 1).

The U.S. Environmental Protection Agency (EPA) estimates that for every ton-mile carried, a typical truck emits roughly three times more nitrogen oxides and particulates than a locomotive. The emissions from a jet aircraft are even higher.

In 1812, Colonel John Stevens published a pamphlet about the superiority of railways and steam carriages over canal navigation and stated that he could "see nothing to hinder a steam carriage moving on its way with a velocity of 100 miles an hour."

Figure 1 - Carbon Dioxide Emissions by Transportation Mode



Source: Californians for High Speed Rail

The two major international airports in the State, Phoenix Sky Harbor International and Tucson International, face capacity expansion challenges as Arizona grows. The Phoenix-Mesa Gateway Airport is emerging as a regional airport that will ease the congestion at Phoenix Sky Harbor. New airports typically involve high capital costs, and complicated processes for clearances and approval. Rail can provide an environmentally cleaner option for movement of both freight and passenger traffic, while reducing the pressure on available aviation infrastructure.

2.3.4 Land Use

Passenger railroads tend to attract compact development near destinations that they serve. This can lead to a reduction in combined transportation and housing costs in urban and rural areas, which tend to provide location efficiency benefits, more efficient public infrastructure, and improved multimodal accessibility. Rail can act as a catalyst for redevelopment and infill that promotes pedestrian mobility and help reduce automobile traffic volumes in focused growth areas by limiting sprawl development patterns.

In communities across the State, scattered development is resulting in increased traffic and increased transportation needs, diminished local resources and reduction in the amount of open spaces. Development of rail can support communities that wish to offer diverse transportation and mobility options, supporting livable choices and a better quality of life. Transit oriented development patterns include pedestrian activity as the highest priority with a train station as a prominent feature of the community center. This land use pattern would include high density development within a 10 minute walk circle around a multimodal node including a mixture of office, residential, retail, and civic opportunities to provide a healthy and sustainable transportation system.

2.3.5 Sustainability

As the State of Arizona continues to grow in population there will be a need for urban and rural communities to expand their existing transportation systems to support the expanded population. There is a desire to use transportation infrastructure as a tool to focus growth and plan for more sustainable built communities that incorporate all transportation modes. The rail system within Arizona can contribute to a multimodal transportation system that connects population and employment centers and more efficiently distributes freight within the state and beyond.

Nationally, the HUD, DOT, and EPA Interagency Partnership for Sustainable Communities have been formed to coordinate federal housing, transportation, and other infrastructure investments to protect the environment, promote equitable affordable development, and increase transportation choices. This newfound partnership will help guide the distribution of federal grants sponsored by HUD, DOT, and EPA in the near future. Planning for a sustainable transportation and land use choices will enhance Arizona's competitive position for a share of this federal funding.

An efficient passenger and freight rail system will encourage infill development and revitalization of existing communities which promotes focused growth patterns surrounding multimodal transportation nodes. This change in development patterns can create location efficiencies within Arizona communities by providing a higher concentration of mixed use development which allow people to work and play within the same neighborhoods which they reside.

United States. Engineer Library.

30th CONGRESS, 1st Session. [SENATE.] EXECUTIVE, No. 7.

NOTES OF A MILITARY RECONNOISSANCE,

FROM

FORT LEAVENWORTH, IN MISSOURI,

TO

SAN DIEGO, IN CALIFORNIA,

INCLUDING PARTS OF THE

ARKANSAS, DEL NORTE, AND GILA RIVERS.

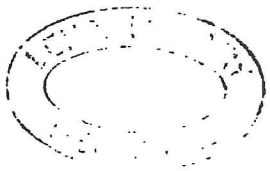
BY W. H. EMORY,
BREVET MAJOR, CORPS TOPOGRAPHICAL ENGINEERS.

MADE IN 1846-7, WITH THE ADVANCED GUARD OF THE "ARMY OF THE WEST."

WASHINGTON:
WENDELL AND VAN BENTHUYSEN, PRINTERS.

1848.

Item #115



WAR DEPARTMENT,
Washington, December 15, 1847.

SIR: In compliance with a resolution of the Senate of the 19th instant, requiring the Secretary of War to communicate to the Senate "a copy of notes of a military reconnoissance of the route from Fort Leavenworth, in Missouri, to San Diego, in California, by Lieutenant William H. Emory, of the topographical engineers, with a map of the said route and of the Arkansas, Del Norte, and Gila rivers; as also the report of Colonel P. St. George Cook's route to California, after diverging from the track of General Kearny," I have the honor to submit herewith a report from the colonel of the corps of topographical engineers, with the copies required by the resolution.

Very respectfully, your obedient servant,

W. L. MARCY,
Secretary of War.

HON. GEO. M. DALLAS,
President of the Senate.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, December 15, 1847.

SIR: In obedience to your orders, I have the honor to submit the report of First Lieutenant Emory, corps topographical engineers, of his reconnoissance of the route from Fort Leavenworth, in Missouri, to San Diego, in California, being a reply to a resolution of the Senate of the 9th instant; also the report and map of the route of Lieutenant Colonel Cook, being a deviation from the route followed by General Kearny, from the valley of the "Del Norte" to a point on the "Gila," called for by the same resolution.

I beg leave to remark that Lieutenant Emory's map, sent with his report, and founded, as the report will show, upon numerous, careful, and well digested astronomical observations, is the original. We have not had time to make a copy. I hope, therefore, that the original will be returned to the archives of this office, to which it belongs. A copy will be made in time for the engraver. This course will also afford opportunity to revise the map. There is one leading position, in reference to which the computers of observations disagree more than a minute in longitude. There is also danger, if the original goes into the hands of the artist, that it will be defaced and seriously injured.

The numerous sketches and drawings referred to in Emory's report are retained in the office, subject to the directions of the Senate. These are also originals, copies of which have not yet been made.

If the work should be printed, it may probably be advisable to have the map and sketches executed under the direction of this bureau, as in former instances.

Respectfully sir, your obedient servant,

J. J. ABERT,
Colonel Corps Topographical Engineers.

Hon. W. L. MARCY,
Secretary of War.

NOTES

OF

A MILITARY RECONNOISSANCE,

FROM

FORT LEAVENWORTH, IN MISSOURI, TO SAN DIEGO, IN CALIFORNIA,

INCLUDING

PARTS OF THE ARKANSAS, DEL NORTE, AND GILA RIVERS.

APPENDIX No. 2.

COLLEGE OF PHYSICIANS AND SURGEONS,
New York, February 10, 1848.

MY DEAR SIR: I have examined the interesting collection of plants which you kindly placed at my disposal, and herewith send you a list of them, as complete as my numerous engagements permit me to make at present. The route which you passed over is exceedingly rich in botanical treasures, as is evident from the number of new species and genera which you were enabled to make under great disadvantages, and in an expedition which was almost wholly military in its character. Most of the new plants which you found are only indicated, or, at most, very briefly described in the following list. A more full account of them will be given hereafter.

I am, my dear sir, very respectfully, yours,

JOHN TORREY.

To Lieutenant Colonel W. H. EMORY.

JULY 22, 1847.

MY DEAR SIR: I give you the following written sketch of the route, not being able, as you request, to get a trace made from my map.

From the 27th June to July 11th, we were traversing the country between Fort Leavenworth and the bend of the Arkansas, a rich rolling prairie embraced between the 39th and 38th parallels of latitude, and the 94th and 98th meridians of longitude.

From July 11th to July 13th, followed the Arkansas to Pawnee fork, in longitude about 99. At this point the fertile soil ceases, except on the immediate margin of the streams.

From the 14th July to August 1st, we were in the valley of the Arkansas, occasionally crossing the spurs of low hills which interrupt the direct course of the Arkansas. This part lies in latitude 38°, and between longitude 99° and 103° 1′.

From the 1st August to the 8th, crossing the plain in a southerly direction and mounting the Raton mountain, about 7,000 feet above the sea, between latitudes 38 and 36.

From the 8th August to the 14th, in the valleys of the tributaries to the Canadian, and crossing the extensive plains between these valleys.

From the 14th August to the 18th, ascending the great ridge between the head of the Canadian and the waters of the Del Norte, halting at Santa Fé, in latitude 35° 41′, on a tributary of the Del Norte, about 15 miles distant from the Del Norte, and about 1,500 feet above that river and 6,850 above the sea.

From August 18th up to the 14th October, all the collections were made in New Mexico, in the valley of the Del Norte, or on the table lands adjacent, and between Santa Fé and the 33d parallel of latitude, (230 miles below Santa Fé.)

From the 14th October to the 19th, we were crossing the great dividing ridge between the waters of the Del Norte and the waters of the Gila, nearly on the 33d parallel of north latitude, and between the 107th and 109th meridians of longitude, measured from Greenwich. The greatest height of this dividing ridge along our trail was about 6,000 feet above the sea.

From the 19th of October to the 22d November, we were following the course of the Gila river, occasionally forced into the mountains to avoid the cañons. This route is never far from the 33d parallel of latitude, and is embraced between the 109° and 114° 30′ meridians of longitude, falling, during that distance, very uniformly from about 5,000 feet to near the level of the sea.

From the 22d November to the 24th, we were on the Colorado of the west, traversing a low sandy bottom.

From the 24th November to the 28th, we were crossing the great desert of drifting sand, in a course little north of west.

On the 28th November, we encamped at the Cariso (Reed) creek or spring, the waters of which, when first exposed, are warm, and emit the smell of sulphuretted hydrogen.

From the 28th November, we commenced to ascend the Cordilleras of California, (the continuation of which forms the peninsula of Lower California,) and reached the highest point of the route December 5th, 3,000 feet above the sea, and as many below the overhanging peaks. From that point we descended to San Diego, a seaport on the level of the sea, in latitude 32° 45′ and longitude 170° 11′ west of Greenwich. This point we reached December 12.

With great respect, very truly yours,

W. H. EMORY.

Professor TORREY, *Princeton.*

APPENDIX NO. 2.—(CONTINUED.)

ST. LOUIS, *February* 13, 1848.

MY DEAR SIR: Your letter, together with the package containing the drawings of a number of most interesting cactaceæ, arrived safely here about two weeks ago.

On the occasion of my report on the botany of Dr. Wislizenus' voyage, I have made a careful investigation of the cactaceæ, of which he brought home with him more than twenty species, and have been enabled to elucidate several points which had been unknown, or obscure before; no doubt because in the hot houses of European gardens these curious plants, though they thrive pretty well, rarely produce flowers and fruit; so that from 800 species of cactaceæ at present cultivated in Europe, perhaps not one-fourth is known as to its flower, and a much smaller proportion in fruit.

I have ventured to describe some of your species from the drawing; my description, however, and the names given by me, must remain doubtful till we are able to obtain some more data to characterize the species. I have written it more for your information than for publication, but if you choose to append it to your published report, I have no objection to it, but must request you to make such corrections or alterations as your notes or your recollection of the plants will enable you to do; for example, as to size, as in some of the drawings no size is mentioned,* in which case I have assumed them to represent the natural size. I have, for convenience sake, numbered the different figures, and shall now proceed to copy for you the descriptions and remarks following my numbers.

1. *Mammillaria.* October 18, 1846; head waters of the Gila, 6,000 feet above the sea.

Proliferous in the highest degree, forming hemispherical masses often of a diameter three and a-half feet; which are composed of 100—200 different heads or stems. Single heads conical, apparently about 4 or 5 inches high, and 2½—3 inches in diameter; color, bluish green; spines white or reddish.

This species appears to be allied to *M. vivipara,* but is distinguished by the conical heads, and the hemispherical tufts, while *M. vivipara* has hemispherical or even depressed heads, and forms flat and spreading masses.

It may be an undescribed species, in which case the name of *M. aggregata* appears to be most appropriate.

2. *Mammillaria.* October 26, 1846. Rare; on the Gila, 3 or 4,000 feet above the sea.

Apparently a *mammillaria,* though the habit of the plant is more that of an *Echinocereus,* but all *Echinocerei* have the bunches of spines disposed in verticle ridges, which is not the case in the figure in question. Stems irregularly cylindrical, with divers contractions and swelling, about 4—6 inches high, and 1¼ and 1¾ inches in diameter, many (in the figure 8,) from one base.

The name of *M. fasciculata* would indicate the peculiarity of this species.

3. *Mammillaria.* November 4, 1846; abundant.

Several (fig. 3,) oval stems from one base, 1½—2½ inches high, and 1¼ inch in diameter; tubercles in about 13 rows; spines whitish, short; one small obovate red berry toward the apex not more than 1¼ line long.

If the figure is correct, this species ought to be distinguished by the name of *M. microcarpe,* as I know of no other Mammillaria with such a small fruit.

4. *Echinocactus Wislizeni.* (Engelm. in Wislizenus' report.) October 26, 1846.

In addition to the description in Dr. W.'s report, which I have drawn up from dried specimens, I observe in this figure that the species has 21 oblique ribs, is of an oval shape, and bluish green color; the ribs are acute, but not compressed, according to the representation of a section, and the groves corresponding.

5. *Echinocactus.* October 25, 1846; 18 inches in diameter.

Height equal to the diameter; shape ventricose, contracted towards the vertex, therefore somewhat urceolate; with 21 straight sharp ribs; spines apparently 8, straight, brown, color of plant bright green; vertex whitish, (tomentose?) fruit 1 or 1½ inches long, oval, yellowish or reddish. Seed obovate, obliquely truncated at base, full one line long, black, opaque, slightly roughened; embryo curved or hooked, cotyledons accumbent, partly buried in the large farinaceous albumen.

This species is distinct from all other New Mexican species examined by me, and is most probably undescribed. I propose to name it after its zealous discoverer, who has, surmounting numberless difficulties, though occupied by severe and arduous duties, found leisure to do so much for the advancement of our knowledge of the wild countries traversed by him, *Echinocactus Emoryi.*

6. *Cereus.* November 21, 1846; 3 feet high.

There can be but little doubt but that we have here a species before us, which I have re-

*Where the size is not mentioned, the original drawings are the size of nature. W. H. E.

ceived from Dr. Wislizenus and from Dr. Gregg, from the neighborhood of Chihuahua, and which I have described in Dr. W.'s report by the name of *C. Greggii*, erect, branching, with 5 compressed ribs, dark green, with whitish areolæ, and about 8 short dusky spines.

The specimen figured here is very remarkable on account of the fruit, which was unknown to me. Provided the drawing is correct, we have here a smooth oval accuminate fruit, crowned with the remains of the corolla, and supported by a distinct stipe of a bright crimson color. A stipe, as well as such an acumination, I have not seen in any other fruit of a cactus. Fruit, with the long acumination, 2½ inches long, ¾ to 1 inch in diameter, stipe about ½ inch long.

7. *Opuntia.* Very abundant on the Del Norte and Gila.

No date nor statement whether the figure represents the natural size or is smaller. The species belongs to the section *elliptice* of Salm; it is ascending, older stems prostrate, branches and younger joints erect, 8—10 inches high; joints orbicular obovate, rounded, obtuse or sometimes acutish, of a bluish green color, 1½ to 2½ inches long, and little less wide; spines short and whitish; berries obovate, scarlet, only about 3 or 4 lines long. If the figure represents the natural size, this species ought to bear the name *O. microcarpa.*

8. *Opuntia.* October 28, 1846; common on the Gila.

Much branched, sub-erect, joints obovate, often acutish, purplish, with two or three longer brown spines directed downwards; fruits obovate, red. In the figure, the joints are 1½—2 inches long, and 1—1¼ wide; fruit about 3 lines long.

There are several opuntiæ known with purple colored joints, but none in the least resembling this, and I must consider it as a distinct species to which I would give the name of *O. violaceæ.*

9. *Opuntia?* October 22, 1846; abundant on the Del Norte and Gila.

A remarkable plant, apparently more like a *Mammillaria* than like an *Opuntia.* The fruit is also represented without areolæ or tubercles, exactly like the smooth fruit of a *Mammillaria;* but this may be an oversight in the artist. The habit of the plant suggests the belief that it is an opuntia of the section *tylindraceæ.*

Joints or branches ascending, cylindrical, tuberculated, 4—6 inches long; 1—1¼ inches in diameter; tubercles very prominent, with about 8 long (1—1½ inches,) straight spines; fruit obovate, umbilicate, scarlet, towards the top of the branches, about 9 lines long, and 6 in diameter.

It is a distinct species, which I am gratified to dedicate to the skilful artist who has drawn all these figures, Mr. J. M. Stanly; I therefore propose for it the name *Opuntia Stanlyi.*

10. *Opuntia.* November 3, 1846; 4 feet high.

Stem erect, with verticilate horizontal, or somewhat pendulous branches; branches cylindrical, strongly tuberculated, about 8 lines in diameter, with short spines on the tubercles; fruit pale yellow, clavate, tuberculate, umbilicate, 1 to 1½ inches long, 6—8 lines in diameter.

This is probably the *Opuntia arborescens, Engelm. in Wisliz's report,* though the spines are represented as being shorter than in my specimens of *O. arborescens* from New Mexico and Chihuahua.

11. *Opuntia.* November 2, 1846.

Somewhat resembling the last, but forming "low, wide spreading bushes." Joints more slender, only about 4 or 5 lines in diameter, alternating (not opposite nor verticillate,) forming with the stem an acute angle, sub-erect, tubercles more prominent, areolæ whitish at their lower edge, with 3 dusky deflexed spines; fruit clavate, tuberculate, pale yellow, 1 inch long, 4 lines in diameter.

I believe this to be an undescribed species, and would propose the name for it of *O. Californica.*

12. *Opuntia.* October 10, 1846; abundant. Three feet high, with spreading branches; the same in circumference.

I can see no difference between this figure and a plant which I have received from El Passo, by Dr. Wislizenus, and which I have described in his report under the name of *O. vaginata.*

Nos. 13—15 are no Cacti. In 13, I recognize the *Kœberlinia zuccarini,* a shrub common in the chaparals of northern Mexico, which has been collected in flower about Parras and Saltillo, by Drs. Wislizenus and Gregg. The fruit is unknown so far; the specimen figured is, however, in fruit; the berry (?) is globose, ¾—1 line in diameter, crowned with the rudiment of the style. It was collected October 23d, 1846, and is described as a shrub 3 feet high, with low, spreading bonghs.

14. Collected November 15, 1846; 4 feet high, rare.

Is, perhaps, another species of the same genus, but the entire absence of flower or fruit makes it impossible to decide. Branches similar, straight, leafless, ending in robust dark spines; but much elongated and sub-erect, not horizontal, as in No. 13.

15. Is entirely unknown to me. Perhaps it is an *amaryllidaceous* plant; the fruit is said to be 5 inches long.

A gigantic cactus was observed along the Gila river, about the middle part of its course,

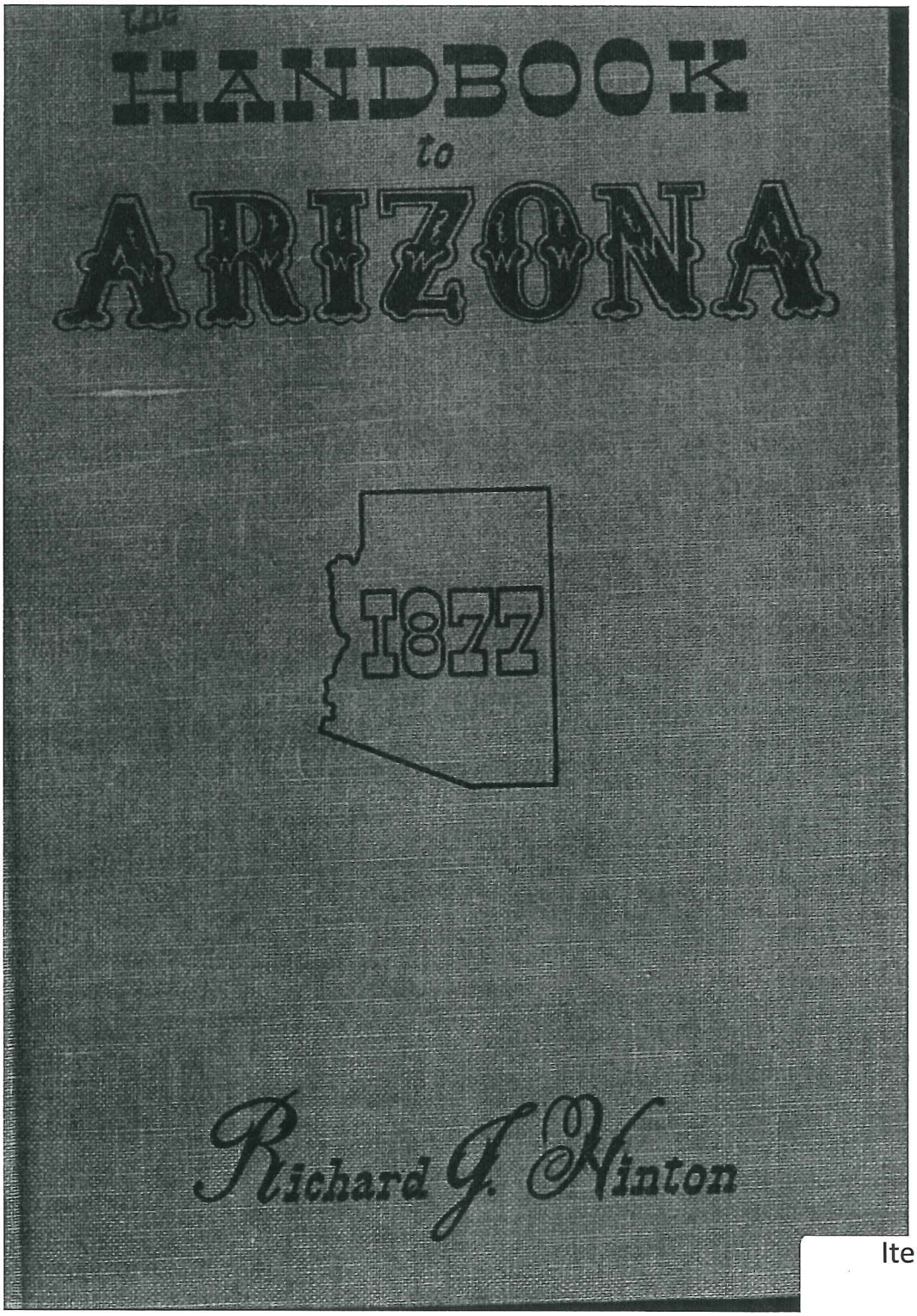
at an elevation of from 2,000 to 4,000 feet; it is frequently mentioned in the report from the 1st to the 9th of November, and figured on several plates, (p. 72 to 79.) It most probably is a true *Cereus*. I judge so from the seed, which fortunately has been preserved. This is obovate, obliquely truncate at base, black, smooth, shining, small, (only about 0.7 lines long;) the embryo is hooked, the cotyledons foliaceous, incumbent; no albumen. If it is a constant fact, that the cotyledons of the seeds of the genus *Pilocereus* are thick and globose and straight, the plant in question cannot belong to that genus, which comprises the most gigantic of the Cactus tribe.

The large *Cereus*, *C. Peruvianus*, is vastly different from our plant, which I would propose to name *Cereus Giganteus*. Unfortunately, I can say but little about the character of this species. The stem is tall, 25 to 60 feet high, and 2 to 6 feet in circumferance, erect, simple, or with a few ereot branches; ribs about 20, oblique or spiral, (?) no spines, (?) (Emory's notes; probably only below without spines,) fruit produced toward the top of the stem or branches. (None of the fruit was procured, being too late in the season; but the molasses expressed from it by the Indians was procured in abundance at the Pimos village.)

It is called *Pitahaya* by the Californians, but this appears to be a general name applied in Mexico and South America to all the large columnar Cacti which bear an edible fruit; especially to *Cereus variabilis*, which is common on the eastern coast, but is widely distinct from our California giant.

Very truly, yours,

G. ENGELMANN.



Item #116

THE

HAND-BOOK

TO

ARIZONA:

ITS RESOURCES, HISTORY, TOWNS, MINES, RUINS AND SCENERY.

AMPLY ILLUSTRATED.

ACCOMPANIED WITH A

NEW MAP OF THE TERRITORY.

BY

RICHARD J. HINTON.

PAYOT, UPHAM & CO., SAN FRANCISCO.
AMERICAN NEWS CO., NEW YORK.
1878.

Republished 1954 by

ARIZONA SILHOUETTES

Tucson, Arizona

CHAPTER XVI.

MISCELLANEOUS.

RAILROADS AND WAGON ROADS. THE VARIOUS LINES OF TRANSPORTATION; STAGE ROUTES; COST OF TRAVEL. FREIGHT EAST AND WEST. PRICE OF LABOR; SKILLED MECHANICS. POPULATION AND ITS GROWTH. TAXATION AND PROPERTY VALUATION. THE SCHOOLS. MEXICAN POPULATION. SEMI-ORIENTAL HABITS AND APPEARANCE. ADOBE HOUSES. LAKES, ETC.

It has been seen by the careful statements heretofore presented that but a small portion of our new territory equals Arizona in natural resources, when it is considered that to almost unsurpassed mineral wealth are added its agricultural and pastoral facilities, abundance (in some portions) of large timber, and a widely varied but generally healthy climate. Like many other good things, however, Arizona is still difficult to reach. The enterprise that conquered the heights and snows of the semi-arctic Sierras, has not been beaten by the depths and drought of the super-tropical Colorado Desert. Turning from the poetry to the prose of this subject, the reader will find the fares, etc., *via* the Southern Pacific Railroad and the Colorado river, fully set forth in the Appendix.

Leaving San Francisco by steamship, the route is *via* the port of Santa Monica, $14 cabin and $9 steerage; thence to Los Angeles by railroad for $1, and from Los Angeles to Yuma, $23 by railroad, or to Dos Palmas $13. The cost from San Francisco by this route will therefore be $38 to Yuma and $28 to Dos Palmas. From Colton to Yuma is $20, and to Dos Palmas $10. Ehrenberg is on the route to Prescott, Wickenburg, and the county of Yavapai generally; but passengers for Mojave county go higher up the river, to Aubrey or Hardyville. Those disposed to take a longer time at less expense can go by freight teams from Dos Palmas to Ehrenberg, and thence to the extensive country of which that point is the distributing center. The Southern Pacific Mail Stage line, of which Kerens & Mitchell are proprietors, claims to be the longest stage line in the United States, extending from Yuma to

Mesilla, N. M., there connecting with another stage line for Austin and other places in Texas. The company own 650 horses and 37 coaches and stages, employing 47 drivers and 104 stock-tenders. The fares on these lines will be found in the advertising pages of this volume. The remaining stage and other connections in the Territory will be found set forth in the Appendix.

For travel by wagon or horse, there are northern routes from Nevada and eastern California crossing the Colorado at Stone's Ferry, thence eighty miles to Mineral Park, forty of which are through the dreaded Death Valley, Detrital Valley or Forty-mile Desert, (as it is variously denominated) on which there is no water. From Mineral Park to Prescott the roads are easy. The Utah Southern Railroad has now reached about 100 miles south of Salt Lake, and is less than 500 miles from Prescott, to which place there are two or three wagon roads. From southern California there is a road by way of the Cajon pass, about twelve miles from San Bernardino, with stations for about 100 miles at frequent intervals, at which travellers are accommodated at reasonable rates. For the remainder of the distance through this Mojave desert to Hardyville, nearly 300 miles from San Bernardino, the only difficulty is want of water, which at one place appears to be absent for thirty-three miles. Approaching Arizona from the east, there are good roads with requisite facilities from the present terminus of the Denver and Rio Grande railroad, from Santa Fé, Albuquerque, Fort Wingate, etc., to Sunset Crossing, on the Colorado-Chiquito, and thence to Prescott; and on the south by Mesilla, New Mexico, on the Rio Grande, whence there is a stage route to Tucson, 350 miles distant.

With the subject of wagon routes is naturally connected that of freight. The routes of supply for Arizona, present and prospective, are more numerous than is generally supposed. The principal ones are four in number, viz: 1. That from San Francisco, or from New York and the east *via* San Francisco, by steamer and railroad, to Fort Yuma and Dos Palmas. At Dos Palmas, 631 miles from San Francisco, freight destined for the northern part of the Territory is sometimes transferred from the railroad to wagons, but is mainly shipped *via* Yuma, and thence by river steamers to Ehrenberg, Aubrey and Hardyville. 2. To Denver, *via* the Kansas Pacific, and thence by the Denver and Rio Grande Railroad to its southern terminus, near the line between New Mexico and Colorado; or by the Atchison, Topeka and Santa Fé, from Atchison to Pueblo,

on the D. & R. G. R. R., and thence to the same terminus. 3. By steamboat and railroad, *via* Austin, Texas, thence by wagons. 4. By rail, *via* Salt Lake city, and the terminus of the Utah Southern Railroad. The first and second routes are in actual use; the third can be at any time made available; the fourth requires some expenditures on wagon roads, pending the slow but continuous advance of the railroad. According to Lieutenant Wheeler's reports, "it appears that the shortest possible distance in an air-line from Beaver to Prescott is 255 miles; that *via* the mouth of the Virgin river, Sacramento Valley, Beale's Springs, etc., (entirely a wagon-road) the distance is 429.98 miles. From the same point to Prescott, *via* the head of the Sevier, the mouth of Paria creek, Little Colorado river, etc., (wagon road, except for short distance in the immediate vicinity of the Little Colorado) the distance is 446.04 miles. By way of Saint George, Utah, the Grand Wash, Colorado crossing of the Expedition of 1871, (wagon road to the Colorado river and from Truxton Springs) the distance is 391.39 miles, which is shortened by a conjectural road *via* the edges of the Colorado plateau and Pahroach Springs by seventeen miles. By ascending the Little Colorado from a point at which it is reached by the Mormon wagon-road from the mouth of the Paria, to Sunset Crossing, where the regularly traveled road westward across the San Francisco plateau leaves that stream, it becomes practicable by well equipped parties, carrying forage, to be obtained while going from the north to the south from the lower Mormon settlements, and from Prescott outward to the north. Water is obtained at practicable, if not always convenient intervals. Grass is plentiful all along the plateau westward from the Little Colorado. The Moqui Indians, in their trading expeditions to Prescott, follow a trail from the Little Colorado at the above point, which leads *via* Crater lake, and it is stated that water exists somewhere on that trail between Crater lake and the Little Colorado. It is estimated that the distance from Salt Lake city to Prescott, *via* the Utah Southern Railroad, to such point as it is soon likely to reach in the valley of the Sevier, thence *via* Panquitch, mouth of the Paria, Little Colorado, Crater lake, etc., could be reduced to 648 miles, while *via* Beaver and mouth of the Virgin it would be 647.56 miles." This gives 548 miles of wagon transportation at this writing. No goods for Arizona are known to be freighted over that road at present, except perhaps small amounts for the settlements on the Colorado-Chiquito; but as the railroad

advances, this route will prove to be a formidable competitor. It is probable that even now goods could be laid down in Prescott, from Salt Lake city, at ten cents, and from the Atlantic or Pacific coasts at twelve to fourteen cents per pound. The road is being pushed forward to St. George, near the Arizona line, less than 200 miles from Prescott, and only 2,800 miles from New York.

In reference to mail communication, the principal routes have been tri-weekly, but from July 1st, 1878, they will be daily, or six times a week, from Yuma to Tucson, and from Prescott to Dos Palmas, the latter route being *via* Wickenburg and Ehrenberg. From Prescott to Santa Fe, *via* Verde, Sunset Crossing and Fort Wingate, the mail will be tri-weekly; also from Wickenburg by Phœnix, East Phœnix and Hayden's Ferry to Florence. The semi-weekly routes will be from Prescott, *via* Williamson's Valley, Mount Hope, Hackberry, Mineral Park and Hardyville, to Mojave City, 190 miles; from Ehrenberg, by Parker, Aubrey, McCracken Mine, Signal, Whitney, Free's Wash and Cerbat, to Mineral Park; from Wickenburg, by Walnut Grove, Bradshaw and Alexandra, to Prescott; from Hayden's Ferry to McDowell; and from Florence to Globe. The weekly routes will be from Mineral Park to St. Thomas, Nevada; from Tucson *via* Ostrich Mine to Sassabi Flat, seventy-five miles; from Tucson *via* Tubac to Monument, seventy-two miles; from Tubac *via* Crittenden to Graterville; from Tres Alamos by Camps Grant, Goodwin, Thomas and Safford, to Clifton; and from Clifton to Silver City, New Mexico.

The distance from Albuquerque, N. M., (towards which the Denver & Rio Grande Railroad is being pushed) is 460 miles. Freight is being delivered from the present terminus to Prescott for five cents per pound by oxen or eight cents by mules, with a prospect of material reduction in case of large business. The expenditure of a few thousand dollars on the Mogollon mountain for a distance of about thirty miles would, it is claimed, make it an excellent road for the whole distance to Fort Wingate, and that the market for wool would be better in the eastern cities than in San Francisco. Rates of freight from New York city to Fort Garland are now $4.27, $3.63, $2.99 and $2.31 per hundred pounds for first to fourth class goods, respectively; from Chicago, $3.52, $2.93, $2.39 and $1.86; from St. Louis, $3.32, $2.73, $2.29 and $1.81; from Kansas City or Leavenworth, $1.50 and $1.25. From Denver to El Moro is 60 cents per hundred pounds, and $72 for a car load of 16,000 pounds. Ore from El Moro to Kansas city is $6 per ton; cop-

per, pig and bar, from Kansas city to Baltimore, 80 cents per hundred pounds. El Moro is on the east fork of the Denver & Rio Grande Railroad, and Fort Garland on the west fork; the latter being nearer to Prescott and divided from the former by the Sierra Madre range. The rates from and to Fort Garland are probably five per cent. higher than to El Moro, which is equally available for the southern part of the Territory with Fort Garland. The latter is in the San Luis valley, or park, 9,339 feet above the sea, and seven miles from the military post of that name. It is in the State of Colorado, but very near the line of New Mexico. From these stations to Mesilla, N. M., is about 350 miles, with no obstructions of any kind. From Mesilla to Tucson is 276 miles, over a road well provided with grass, wood, and water, having running streams at no great distance apart. From Mesilla to the Rio Miembres is 71 miles; thence to Valle del Saux, 72 miles; from there to San Pedro river, 80 miles; and thence to Tucson, 53 miles—being a total of 626 miles from Tucson to the present terminus. By using ox-teams and not feeding grain, the expenses of freighting by wagons is said to be reduced one-half; and three-quarters of a cent per pound per hundred miles is alleged to be remunerative, when there is freight both ways, in a country where grass and water are so abundant as on this route. If these estimates are correct, five cents per pound would pay the expense of freight from El Moro to Tucson, which, added to the railroad freights as above stated, would give $7\frac{1}{4}$ to $9\frac{1}{4}$ cents per pound as the cost from New York to Tucson, exclusive of small incidental charges.

For southern Arizona there is still another route available from the east. The Mesilla (N. M.) *Independent* states that first-class freight can be shipped from New York to Austin, Texas, in nine days at one cent per pound, and less for special rates. From Austin to Mesilla, less than six hundred miles and time less than thirty days, freight is estimated at four and a half cents by oxen. At one cent per 100 pounds, three cents more would bring it to Tucson, being eight and a half cents from New York to Tucson, exclusive of half a cent for commissions, etc. The Southern Pacific Railroad is, however, bidding well for this business. The rates from New York to San Francisco by railroad range from $1.25 to $6 currency per 100 pounds. From San Francisco to Ehrenberg, $3 coin per 100 pounds general merchandise, $2.50 for grain per 100 pounds, or $1.75 by the car load. From San Francisco to Yuma $1.60 to $2 per 100 pounds; grain $24 per ton. From Los Angeles

to Yuma, general merchandise, $1.76 per 100 pounds; grain $17.50 per ton. From San Pedro or Santa Monica to Yuma, $1.82 per 100 pounds for merchandise. From Yuma to Ehrenberg $20 per ton by weight or measurement. From San Francisco to Santa Monica or San Pedro, the freight by steamer has been, by measurement, $5 per ton of forty cubic feet. By this route freight from New York to Prescott would appear to be about ten cents per pound, estimating four cents from New York to San Francisco, three cents from San Francisco to Ehrenberg, and three cents (188 miles) from Ehrenberg to Prescott. This seems to be from two to four cents per pound less than it could be done at present by the Utah route, and perhaps a fraction lower than practicable *via* the Denver & Rio Grande Railroad. From San Francisco to Tucson the total rate would probably average $7 for general merchandise, the expenses of hauling being greater west than east of Tucson, on a large part of the route. There are few people who have the remotest idea of the capacity of the freight wagons, with their twelve to twenty mules attached to two or three wagons, one being on the trail of the other. These teams are capable of carrying from 12,000 to 18,000 pounds. One man conducts the whole affair. Riding the near wheeler mule, he manages the eighteen mules with one line, attached to the near leader; and from his seat in the saddle, with a rope, he manipulates the brakes, and thus he conducts the train. The freighters have considerable pride about keeping up the appearance of their stock. Sometimes every mule will have a row of Russian bells strung up over his collar, and they travel over the country to the music. To fully realize the colossal size of one of these "land ships," one must observe an ordinary wagon beside it, then see the contrast.

Many persons coming from colder regions to southern California, Arizona, etc., erroneously suppose that warm clothing or coverings will no longer be necessary or desirable. As will be seen from the chapter on climate, Arizona is very much diversified as to temperature; and even in its warmer portions the difference between day and night is usually so great that two pairs of blankets can be utilized for a large portion of the year; overcoats are often desirable, and warm under-clothing is a necessity. All kinds of clothing, woolen goods, and notions bear high prices in Arizona, and are likely to do so for some years. In view of these considerations, persons coming to the Territory to reside should not dispose of any warm clothing or blankets they may possess; as, even if not needed

in the particular place settled upon, such changes of locality of even short distances as business exigencies may render desirable, might involve a very great change in temperature, in view of the peculiarly diversified conformation of the surface.

It is by no means certain that Arizona is now a good place for the laborer without some capital. The cost of living, though much reduced, is still great as compared with older settlements. There are as yet few organized industries, and it is expensive to get there. Experienced and skillful mechanics get good wages when employed; but their chances for employment much depend upon their being on hand at the time and place where their services are needed. A man who is not only expert at his special trade, but is generally "handy," and has means enough to keep himself for a few months, could soon pay his way, and by watching opportunities place himself where his services would be in demand at a good price. These uncertainties being understood, and making liberal allowances for local variations, above and below, the following rates are now approximate for American labor:

Blacksmiths $3 to $4 per day and board; wagon makers, $4 to $6 per day, without board; masons and bricklayers, $5 to $7 per day without board; painters, $5 per day and board; carpenters, $4 to $6 without board; miners $2.50 to $3.50 without board, and in general $2 per day and board. The following rates are with board, viz: herders, $40 to $50 per month; farm hands, $30 to $40; cooks, $40 to $60; teamsters, $50 to $60; stage drivers, $50; hostlers on stage lines, $30 to $40. In the south white laborers, teamsters, herders, etc., are but little in demand, though skilled mechanics sometimes get higher wages. For common labor, Mexicans can be hired at less rates, as specified in the description of Tucson. Their labor, however, is open to objection, so that a steady, industrious, and reliable white man would probably secure a preference at higher compensation.

In population and wealth Arizona is rapidly advancing. By the census of 1876, the population of the various counties was as follows, viz: Yavapai, 13,738; Pima, 8,117; Maricopa, 3,702; Yuma, 2,212; Pinal, 1,600; Mojave, 822; giving a total of 30,191, besides about 25,000 Indians. The increase, however, is very rapid. The population of Yavapai county at the present time is not less than 15,000, some claiming as high as 20,000; and the towns alone in Mojave county now contain over 600. The taxable property of the Territory this year amounts to $1,800,000, an increase of $400,000 in one year. Assuming the population to have increased in about the same

ratio, it would now be over 38,000. Yavapai county this year pays $60,000 for taxes; Prescott pays $7,000, besides licenses; Pima county pays $20,000 for taxes. In Yavapai county there are estimated to be 200,000 sheep, 20,000 cattle and 4,000 horses and mules.

After long and energetic labor on the part of Governor Safford and others, a good common school system has been established in Arizona. Of 2,955 children in the Territory, according to the census of 1876, (1491 boys, 1464 girls) 1,157 have attended school, and 1,450 were able to read and write. The percentage of illiteracy among minors though large, owing to the recent introduction of efficient measures is rapidly decreasing, notwithstanding the drawbacks attendant on new and sparsely settled regions in this respect. A tax of thirty-five cents for every $100 of taxable property in each county is levied for school purposes, besides a general one of fifteen cents per $100 collected and paid into the State Treasury for educational purposes. The following table (incomplete as to Yavapai county) is an outline of the school statistics of Arizona:

COUNTIES.	No. of schools.	No. of pupils.	Average attendance.	Illiterate	Total children, 6 to 21.	No. of teachers	Agg. pay of teachers
Pima.....	5	206	161	570	1282	6	$600 00
Yuma	3	126	94½	279	519	3	300 00
Pinal.....	1	102	69	157	249	1	140 00
Maricopa.	3	69	48	104	213	3	225 00
Mojave...	2	(?)46	(?)30	12	33	1	87 50
Yavapai..	..	(?)500	..	..	...	..	.. ..

Schools among the Indians, except at the Moqui villages, have not proved very successful, perhaps in some cases from a deficiency in the appropriation. Governor Safford recommends that a few children should be selected from each tribe, taken to some convenient locality near the reservation to be instructed to read, write and speak our language, their parents to be allowed to visit them at stated times, they to be allowed to return to their people at vacations; and on attaining sufficient age, to become teachers of their own people, or learn some useful industry; the expenses to be defrayed from the appropriation for education. The presence of a considerable Mexican population in the southern half of Arizona adds to the peculiar conditions which prevail in material, as well as social affairs. The public school discussion has acquired a sharp character, owing to the church influence and polity; but at present the debate adds vigor to educational efforts, and creates a healthy rivalry between the public and the parochial schools.

In many respects the Mexicans are quite primitive in their habits. For instance, they still use as a plow a sharpened stick of wood fastened to a beam, which beam is tied to the horns of the cattle by means of thongs of rawhide, serving the purpose of a yoke. No iron ever enters into the construction of their carts—little clumsy vehicles, usually drawn by the patient *burro*, and made entirely of wood and rawhide, the wheels being sections of a stump of a tree. The sun-dried brick are literally made without straw. All grain is threshed in the field; nor do they "muzzle the ox that treadeth out the corn." Chairs and tables are not common articles of furniture in the poorer Mexican houses. The floor is a common settee. With them fingers were made before forks, and continue to be used as nature's substitute therefor. They eat largely of *tortillas*—unleavened bread; *chili*—red pepper; *frijoles*—or beans, and garlic. The tortillas are made of corn, which is first soaked in a weak lye, and then boiled until it is perfectly soft, when it is crushed at a *metate*, consisting of two flat stones, as seen in the engraving. The work is in all cases done by women

METATE.

The other method of grinding is to be seen in the picture of the improved Mexican mill, whose revolutions of not over a score

HORSE MILL.

per hour, accomplished by the untiring patience of a much abused *bronko*, or *burro*, is not a remarkable piece of machinery as a product of 300 years of cogitation. After the corn is crushed at the *metate*, it is moulded into a kind of pancake, and baked on a heated iron or stone. Meat rarely forms any part of the ordinary Mexican *cuisine*.

The adobe houses that are used throughout semi-tropical Arizona are not comely or inviting in aspect; but with the improvements as to light, ventilation, etc., which Americans have already introduced, they can be made exceedingly comfortable, and are, in fact, the character of buildings best adapted to the climate. The cost of adobes is about $10 per 1,000, and with construction, the cost will be about $40 per 1,000.

The Mexicans are largely mixed with Indians, and they have the broad, flat, red face of the Pimas or Papagoes far oftener than the dark, sallow, bronzed and rather narrow faces of the Mexican, who can boast truly of both Castilian and Aztec blood. The Mexicans seem to be patient and industrious, too, in their shiftless way. They are good prospectors, though not ambitious workers. They appear, also, to inherit a faculty which their Aztec ancestors had in a supreme degree. When Cortez entered Mexico with his companions he was struck with admiration at the stupendous aqueducts by which water was brought into the city, rivaling the great Roman works in their extent and skill of construction. Later conquerors have expressed the same admiration. The degenerate Mexican referred to is still a natural engineer. He can construct an acequia with unerring exactness, find the right place at which the water may be reached, and whereat sufficient fall may be obtained, without having the slightest knowledge of the reasons therefor—succeeding often where better informed and more pretentious persons fail. Mr. Mexican is picturesque, indeed, as his swarth face and rolling eye, keen, yet slumberous of aspect, looks furtively at you from beneath the broad and dirty sombrero, while he leans lazily against a dirty adobe wall, wrapped in his dirtier serape, which, somehow, becomes his unconscious artistic attitude of listless indifference as its folds drape in graceful lines about him. The foreign, semi-oriental aspect of all things in semi-tropical Arizona—skies, mountains, vegetation, arid mesa, etc.—is not diminished by the presence of these people. The water vessels recall the monumental evidence of Egyptian utensils, the patient "burros" are Syrian in aspect, while the manner in which oxen are yoked can be pithily and exactly described by a biblical quota-

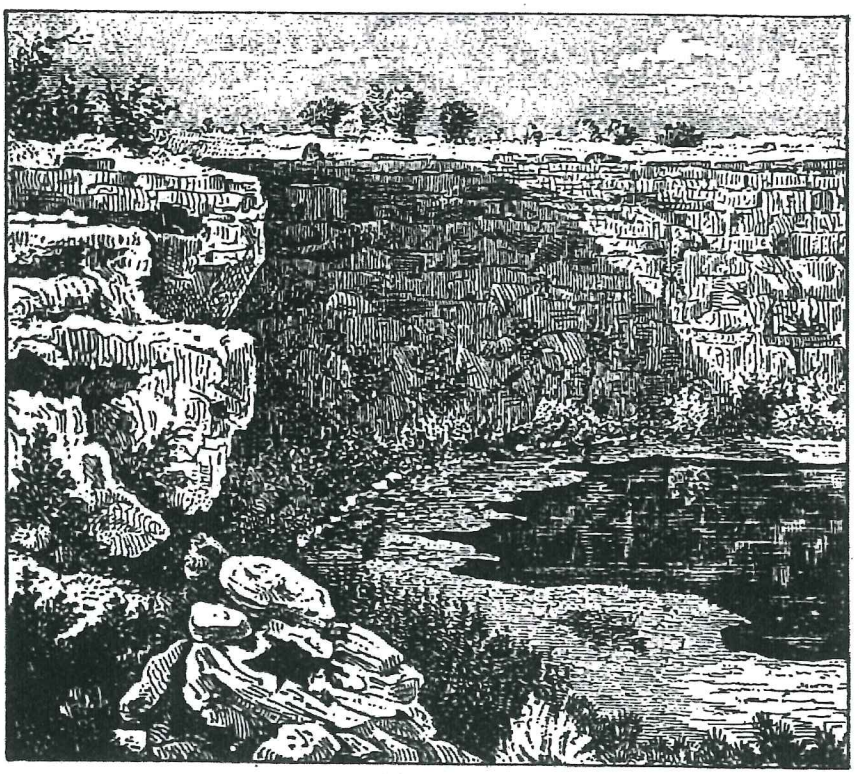
tion. The water carriers appear as if they had stepped from some Old Testament picture, and the asses, laden almost beyond their own size, are duplicated again and again in Egyptian scenes of this period, as well as in those of more ancient times. The Pimas add to the semi-oriental aspect of the scene. Here is one of them: A broad, reddish face, with antique mould of features, good-humored and smiling; a lithe, spare frame of middle stature, with bare red feet and legs partly uncovered; head crowned by a red turban, and form clad in a dirty white

STONEMAN'S LAKE.

shirt and drawers, with a red sash about the waist—a semi-burnoose in style—made up an ensemble which it was easy to consider as a semi-civilized Bedouin of the desert waiting for backsheesh from some over-plundered traveler of our own stock. It was but a Pima, smiling good-naturedly at the passing traveler.

In lakes, Arizona is not a marked success as to size, though they are numerous in the northern and north-eastern parts of the Territory; some of them are called "wells," and the

water is usually pure and fresh. One near Navajo Springs is known as Jacob's well. Apache lake is in the vicinity of the post of that name, near the north fork of the White mountain river. Reservoir lake is on the eastern base of the White mountains, and consists of a shallow basin floored and walled by lava. The water is shallow and weedy, its maximum area is about 65 acres. Robert Garside, of Kirkland valley, has had a boat built in Prescott to navigate the lakes on his ranch. Stoneman's lake, represented in the cut, is fifty-eight miles



MONTEZUMA WELL

west of Sunset Crossing, on the Colorado-Chiquito, and thirty-one miles north-east of Camp Verde. Several lakes are found near Bill Williams mountain. The Montezuma well, fifty-five miles north-east of Prescott, twelve miles north of Camp Verde, and two miles east of Mr. Arnold's farm, is in a limestone formation, on a bare, rocky, and level mesa one hundred feet above the creek and seventy feet above the water, which is clear, pure, and about a hundred feet in depth. The opening to the well is circular and about six hundred feet across; its

inner walls are perpendicular. On the north-west side, midway between the water and the surface of the mesa, are three or four pre-historic cave dwellings, twelve to twenty feet frontage, and about the same depth. The eastern and south-eastern borders of the well are within thirty to one hundred feet of Beaver creek, from which it is separated by a rim of enclosing limestone rock, which was built up with stone buildings its whole width, and about one hundred feet in length; the walls of these old buildings yet remaining are twenty feet high in places. On the south-east side of the well is another old cave-dwelling near the surface of the water, which runs off under the cave into the creek, which never dries up. Broken pottery-ware is abundant in the immediate vicinity. Dykes of lava are on the flat, and the well itself is supposed to be the crater of an extinct volcano. There are many other features in the Territory worthy of mention, but the limits of this chapter and volume compel omission of reference.

Early Copper Mining in Arizona
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Early Copper Mining in Arizona*

Robert G. Raymer

Our present civilization is based upon the use of metals, of which copper is one of the more important, owing to its employment in the numerous applications of electricity. America produces one-fourth of the world's supply, and Arizona yields two-fifths of the American stock of copper. It is the object of this paper to describe the beginnings of copper mining by Americans in this important area.

The earliest report of metallic wealth in the land of Arizona was made by Antonio de Espejo. Writing of the mines found by his party of five in the year 1583, this Spanish soldier said, "with my own hands I extracted ore from them, said by those who know, to be very rich and to contain much silver . . . where the mines are located the country is good, having rivers, marshes and forests; on the banks of the river are many Castilian grapes, walnuts, flax, blackberries, maguey plants and prickly pears. The Indians of the region plant fields of maize and have good houses." The area thus described was probably on the eastern slope of the Aquarius mountains, not far west of the site of Prescott.[1]

Father Kino was in the Gila valley about a century later and in his *Celestial Favors* mentions the mineral wealth of the region, but the present writer has found no evidence of any mining earlier than the discovery, about 1736, of the silver lode known as Planchas de Plata, in the mountains at the head of the eastern branch of Rio Altar.[2] The exploitation of this de-

*This paper was read at the annual meeting of the Pacific Coast Branch at Stanford University, in December, 1934.

1 Herbert E. Bolton, ed., *Spanish Exploration in the Southwest* (New York, 1916), 187.

2 Hubert Howe Bancroft, *History of the North Mexican States and Texas* (San Francisco, 1884), I, 525.

posit by Mexicans was short-lived, passing into tradition before the region was visited by Americans. Some ore was shipped about 1774 from the Quijotoa mountains through the port of Muleje, Baja California; but there is, apparently, no record of any extensive operations by the Mexicans in either of these areas.[3]

Slightly eastward of the boundary which separates Arizona and New Mexico, there lies on Mimbres Creek the famous Santa Rita de Cobre mines. These mines were made known to, and mentioned by, Lieutenant Pike;[4] they were worked by the elder Pattie;[5] and were visited and described by Bartlett, the boundary commissioner.[6] From these rich deposits, first worked in 1804, twenty thousand dusty, copper-laden mules annually toiled down the Rio Grande valley and across the desert to the mint at Chihuahua. At least that is what Pike reported as the condition in 1807. It is hard to believe that the Apaches refrained from attacks until they made the great foray of 1838 which put an end to exploitation for a number of years thereafter. The mines were active again when Bartlett made this settlement his headquarters for a few months in 1851; and Sylvester Mowry reported them to be working during the ensuing decade, stating that the copper found its way to New York through Port Lavaca, Texas.[7]

Unhappily, however, only three years later J. Ross Browne "found the beautiful hacienda of the Santa Rita Company now solitary and desolate. The houses have gone to ruin, and only a few adobe walls, furnaces, and the framework of the mill remain to mark the spot formerly so full of life and enter-

[3] Bascom A. Stephens, *Quijotoa Mining District Guide Book* (Quijotoa, Arizona, 1884), 21.

[4] Zebulon Montgomery Pike, *Exploratory Travels through the Western Territories of North America* (Denver, 1889), 303; Elliott Coues, ed., *The Expeditions of Zebulon Montgomery Pike* (New York, 1895), II, 728.

[5] *Pattie's Narrative* in Reuben Gold Thwaites, ed., *Early Western Travels* (Cleveland, 1904-1907), XVIII, 86, 110-119, 178-180.

[6] John Russell Bartlett, *Personal Narrative of Explorations . . .* (New York, 1856), I, 227-229.

[7] Sylvester Mowry, *Arizona and Sonora* (3rd ed., New York, 1864), 24, 37, 38, 84, 168-170.

prise." [8] Between the visits of Mowry and Browne the federal troops had been withdrawn for service against the Southern Confederacy and the Apaches had come to destroy the property of those who had invaded their territory.

Mining of any kind in Arizona was extremely hazardous owing to hostile Apaches, and relatively unprofitable owing to the lack of facilities for transportation to a market. Notwithstanding the dangers, miners began traversing the region soon after the discovery of gold in California, often prospecting as they went. For the protection of these travellers, Fort Yuma was erected in 1851, opposite the mouth of the Gila, but it would have been asking too much of the small garrison to expect them to pacify Arizona.

Not long after the Gadsden Purchase, two adventurers, Charles D. Poston and Herman Ehrenburg, successfully prospected for silver near Tubac. Some distance west of Tubac, at Ajo, there was an old copper mine, long ago worked by Mexicans. Learning of this deposit, Poston returned to San Francisco and organized (1854) the Ajo Copper Company to finance operations.[9] When mining here was well under way, in 1857, its ore was packed more than a hundred miles by desert trail to Yuma. The contractor who owned the animals collected $105 a ton for this transportation until another freighter found it somewhat cheaper to move the ore in wagons. But this method also had to be abandoned, and the mine closed, owing to shortage of water along the route.

Between Ajo and Tubac, about twenty-four miles from the latter, Poston explored a silver-copper prospect even richer than the Ajo mine. In 1856 the Arizona Mining Company, headed by S. F. Butterworth, was formed to exploit the new lode, sometimes called the Arizona mine, sometimes Cerro

[8] This is quoted from Mowry, *op. cit.*, 239. The record of Browne's journey was published on Mowry's request as a part of Mowry's handbook, then in press. The material next appeared serially in *Harper's Magazine,* and later was bound separately under the title *Adventures in the Apache Country* (New York, 1868).

[9] Stephens, *op. cit.*, 22, quotes a letter from Poston giving details. Sylvester Mowry, *op. cit.*, 28, when writing in 1864 refers to the Ajo mine as "now known as the Arizona Copper Mine." Is this a slip of the pen?

Colorado, and later the Heintzelman. This mine is of unusual interest, first, because it later furnished a name for the entire territory; and, secondly, because here was made the first American experiment in applying the barrel process to the treatment of argentiferous copper ores, a method of smelting introduced by Guido Küstel.[10]

An assay of selected ores from the Cerro Colorado, made in the year 1857 at San Francisco, showed a value of $8624 in silver and $111.20 in copper for a ton of ore. Another series of eight assays on different ore bodies in this mine by other metallurgists ran $1424 per ton; still other tests showed from thirteen to sixteen per cent of silver and 37 per cent of copper. A shaft was sunk 140 feet before the work was interrupted by the war.

The geologist, R. Pumpelly, having visited the mine in 1861 prior to its temporary abandonment, found the reduction works on the Arivaca ranch, eight miles distant from the workings, and reported that Arivaca had too little wood for extensive operations.

Two years later Superintendent Küstel reported to its distant owners that, although wood and water were scarce in the vicinity, there was sufficient wood to run a small hoisting engine, and water enough for a hundred men and animals could be had at a depth of one hundred feet. Was the place truly as desolate as Küstel reported? Quite a contrary picture is found in the statement of the first engineer to inspect the premises, who wrote that this mine was situated on the Arivaca ranch of 17,000 acres and had "much beautiful meadow land, fine pasture on the low surrounding hills for thousands of cattle; live-oak grows in the gulches, mesquite on the hills, and on the lower ends of the stream it is thickly lined for five or six miles with groves of cottonwood, ash, walnut, and other useful woods for farming and mining purposes." [11]

But, in studying the copper mines of Pimería Alta, we must

[10] R. Pumpelly, "Mineralogical Sketch of the Silver Mines of Arizona," in Mowry, *op. cit.*, 158-175.

[11] J. Ross Browne, *Report on the Mineral Resources of the States and Territories west of the Rocky Mountains* (Washington, 1868), 445.

not be diverted too long from the prospects reported by Espejo. In 1858, copper ores were discovered on Bill Williams's Fork of the Colorado. The first shipment was made four years later when the owners of the Planet mine, a part of this camp, sent out a hundred tons of ore. It was packed on mules a distance of twenty miles to the Colorado river and thence taken by boat to San Francisco, where it yielded a net profit of $100 a ton. By 1866 there were fifty good mines on both sides of the river with an annual production of about 1500 tons, the labor for working so large a body of ore being furnished by Indians, Mexicans, and Chinese. A contemporary reported that "gentlemen just returned from these mines state that there are upwards of 1000 tons of ore that will average forty per cent now lying on the river bank ready for shipment. The steamers and two or three schooners employed in the trade are wholly inadequate for the purpose. . . The whole country appears to be formed of the ores of iron and copper, the hills for miles around being colored red by the iron, or green and blue in patches where waters containing carbonate of lime in solution have percolated through the copper." [12]

The lodes were sufficiently rich to warrant an investment in reduction works, for, while the machinery tied up large amounts of capital, the concentration of the metal at the mines would cut the freight charges to a half or even a quarter, depending upon the quality of the ore. A ten-stamp battery and a $100,000 smelter were erected in 1866.

While the present narrative is primarily concerned with the production of copper it should be remembered that the silver and gold production was even more valuable. All of these mining activities, taken together, aroused a desire to enjoy the protection of a legal government. This wish eventuated in the separation of the western portion of New Mexico to form therefrom the territory of Arizona.

As early as 1856 a convention had been held at Tucson which had memorialized Congress to erect a territory named Arizona.

[12] J. Ross Browne and James W. Taylor, *Reports upon the Mineral Resources of the United States* (Washington, 1867), 156.

Two years later the legislature of New Mexico favored this proposal; but it was as ineffective in securing Congressional approval as the former action had been. In 1860 a constitutional convention drafted the frame of a provisional government to remain in force "until Congress shall organize a territorial government," but the plan was never put into operation, possibly because it is easier to draft constitutions than to collect taxes. And although the matter was kept before a Congress busy with war, the federal authorization for the forming of a territory was not given until February, 1863. It was well known that the sentiment south of the Gila was strongly in favor of the Southern Confederacy and this may have been a factor in the delay.

On December 27, 1863, Governor John Goodwin formally established the new government in a wilderness camp at Navajo Spring. Then began a struggle between the miners of Bill Williams's Fork and those of the Santa Cruz valley as to whether the capital should be at the newly established Prescott or at the old presidio of Tucson. After a four years' struggle the southern camp won by a single vote, but Prescott had its revenge ten years later, only to lose its supremacy in 1890 to the upstart town of Phoenix, about halfway between the two older settlements.

Some reflection of the disordered state of the Territory in the middle sixties may be seen in the first mining law, effective January 1, 1865, which legalized the laws and proceedings of all mining districts theretofore established and provided that "by reason of the Indian wars and unsettled conditions of the country, the time within which a shaft is required to be sunk, or other labor performed on a claim, shall not commence until two years from the day this act takes effect."

Until a railway line should cross Arizona, giving access to the eastern market or to the Pacific coast for transshipment, the copper industry of the Territory was doomed to be small, even if internal conditions should permit mining activity on a large scale. The chartering of the Atlantic and Pacific Railway, with a land grant along the 35th parallel, gave promise,

in 1866, of relief from this handicap; but it was not until 1880 that the railway lines of two competing companies reached Prescott and Tucson.

Before the railroads came in, however, several other important copper deposits were discovered in Graham and Cochise counties. The Graham county deposits, of which the Longfellow came to be the most important mine, were discovered by a group of prospectors in 1871. Two years later the Lesinsky brothers of Las Cruces, New Mexico, began development and smelted their ore in a crude Mexican furnace. In the following nine years, before they sold to a group of Scotch capitalists, they had produced twenty million pounds of copper. Although coke for the furnace was brought eighty miles and their nearest railroad station stood at La Junta, Colorado, seven hundred miles distant, the richness of the ores was so great that the mines were profitable even under those handicaps.[13]

In Cochise county lies the richest mine of which Arizona can boast, the Copper Queen. Here is a bed of cupriferous lime quartzite and porphyry five miles long and two or three miles wide, which yielded more than three million dollars worth of ore in the first half-decade.[14] In fact so rich was this area that the yield of copper in one year alone (1925) was worth ten times the price paid for the entire Gadsden Purchase.[15]

The coming of the railroads in 1880, three years after the discovery of the Copper Queen, marked the beginning of a new era. The Apache troubles were past; the possibilities of large scale production and generous profits were present. Notwithstanding the new sources of copper then developed in Montana whose production brought a 54 per cent break in the price of the red metal, the owners of the Arizona mines found themselves wealthy. The hardships of the desert had been metamorphised into the luxury of mechanical civilization. Although the prospect hole of Antonio de Espejo was vastly different

[13] Patrick Hamilton, *The Resources of Arizona* (2nd ed., San Francisco, 1883), 103-104.

[14] Hamilton, *op. cit.*, 85.

[15] *Mineral Resources* (1925), I, 572.

from the shafts and smelters of the Phelps-Dodge Company the history that lies between is full of fascination for him who will delve into its arcana.

ROBERT G. RAYMER

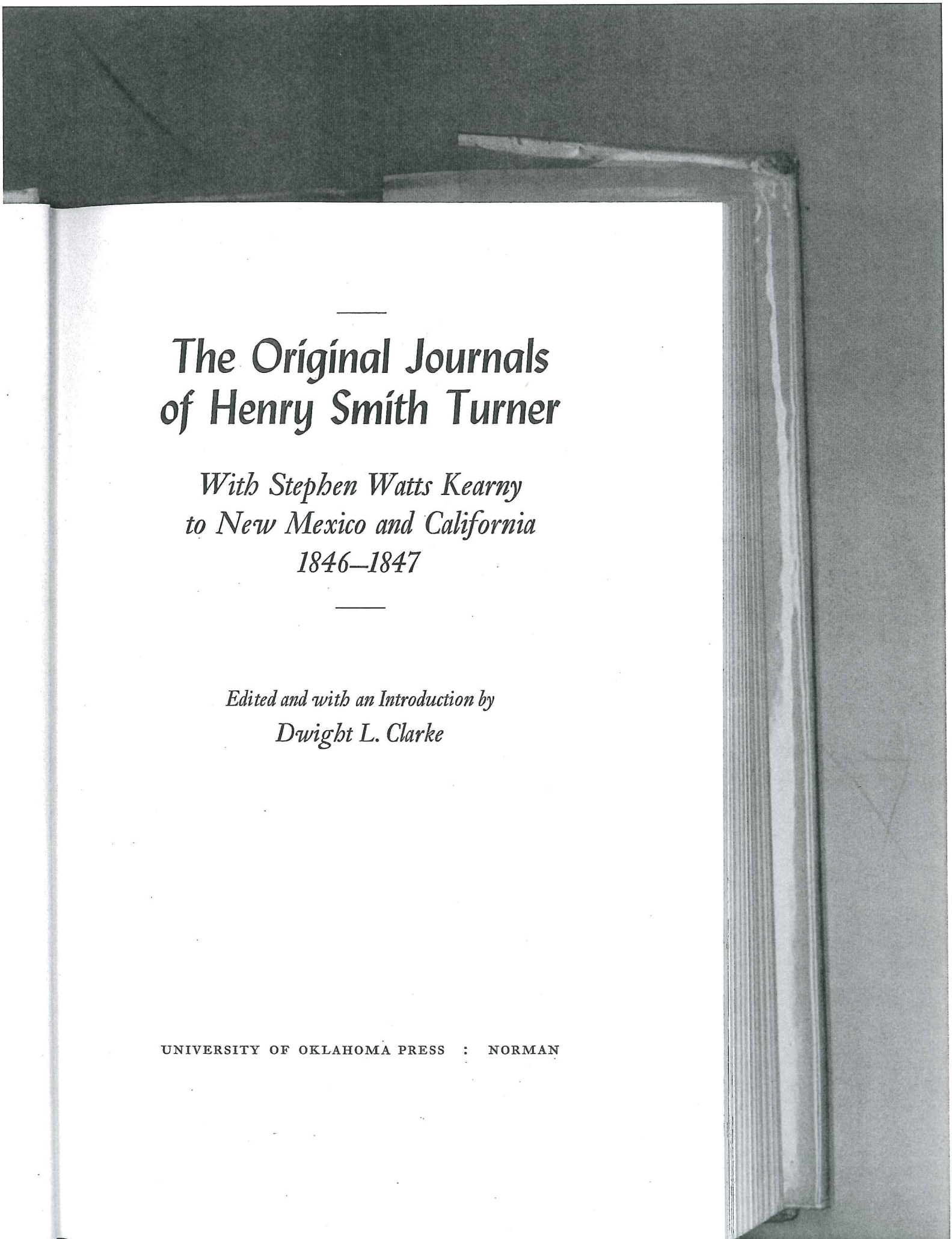
University of Redlands

The Original Journals of Henry Smith Turner

with Stephen Watts Kearny to New Mexico and California, 1846

EDITED AND WITH AN INTRODUCTION BY

Dwight L. Clarke



The Original Journals of Henry Smith Turner

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BY DWIGHT L. CLARKE

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Journal of Henry S. Turner, 1846

June 30, 1846, Tuesday.—Col. Kearney [*sic*] with staff and Battalion of Light Artillery, left Fort Leavenworth marched to branch of Stranger 20 miles, and encamped.[1] Baggage wagons of artillery not come up: 20 miles.

July 1, Wednesday.—Col. Kearny and staff crossed the Kanga [Kansas] river having marched about 16 miles Artillery marched to the river and encamped on its left bank: baggage wagons not yet up—one company of infantry crossed the river—the others remained on left bank: weather hot. 36 miles.

July 2, Thursday.—Col. Kearny and staff remain in camp: Captain Angney Infantry Company move on: Captain Murphy Infantry Company cross the river and encamp near the Colonel. The Artillery Battalion cross the river and encamp near the Colonel. Captain Fisher Company baggage not yet up. Weather more pleasant.

[1] Stranger Creek, a tributary of the Kaw, or Kansas, River.

Knight, who it is said made much money in selling copper to the inhabitants of Chihuahua and Sonora, these mines have been abandoned in consequence of disturbance from the Indians. They appear to have yielded much copper, and to have had much work done in them. The ruins of some 50 houses are still on the ground. 305 miles.

October 19, Monday.—Set out in the morning expecting to march about 12 miles to a spring, where it was expected we would meet the Apaches, with whom the General was anxious to have a conversation. On arriving at the spring and finding the Apaches had reached there, also that the grass was not good enough for a camp, we marched on having been informed by our Mexican guide that in 9 miles we would find water and good grass in great abundance, the guide however, was much mistaken, and we had to march 18 miles and did not arrive at the place until 8 at night. A few Apaches came up at night and reported that Red Sleeves with 30 of his men were coming on and would be in camp early in the morning. We crossed today the dividing ridge between the waters that flow into the Atlantic and those that flow into the Pacific. There was nothing remarkable about the spot; the view from it was remarkably fine, but there were much higher points in the vicinity. We are tonight encamped on a small tributary of the Rio Gila, which stream is but a short distance from us. The country continues extremely broken, although more practicable routes are obtained through, and indeed a good wagon road may be found along the route we have come from the copper mines. The grass everywhere is abundant, and of the finest kind—water also in sufficient abundance. We marched 30 miles today. It has been showery about us but no rain where we were. The weather continues fine, and most propitious for our progress. 335 miles.

October 20, Tuesday.—Made a later start about 12 M. in consequence of getting late into camp last night. Some 30 Apaches came into our camp just before we left. A few good mules were obtained from them, with much difficulty—they exhibit much more shrewdness in trade than we expected, and have the same provok-

ing way of asking more when you offer what is first demanded.—We followed down the stream on which we were encamped, passing through a narrow passage for the distance of 5 miles, and came on the left bank of the Rio Gila, a large tributary of the Rio Colorado, emptying into the latter about 100 miles from its entrance into the Gulf of California. The Gila is a beautiful stream—perfectly clear water, and about 30 steps across, timbered with cotton wood principally—there is a tree on this river, not abundant, the bark of which resembles the [illegible] and the leaves the maple. The Gila abounds in fish—though not much of a fisherman, was out about 30 minutes and brought in 10 or 11 fish from 6 to 10 inches long—it appears to be a fine fish, not seen before by any of us—shall eat at supper tonight. Marched 7 miles today—are encamped on the right bank of the Gila, which in this part of its course, passes through narrow gorges of the high mountains towering about us. Grass tolerably good. 342 miles.

October 21, Wednesday.—Started a half hour earlier than usual, having been informed by Mr. Carson the guide, that we should march a rough road, and would be all day in accomplishing it—descended the Gila about 5 miles, and coming to an impassable canyon or gorge, left the river and climbing up the side of a mountain to the right, by an obscure trail, and taking up a course a little north of west and for the distance of 10 or 12 miles, wound our way over the most broken, stony, and precipitous road I have ever traveled over—up and down steep mountains, over points and ravines jagged with sharp rocks, making it most laborious, and almost dangerous for our mules. At last we came to the bluff overlooking the river, the sides of which seemed more precipitous if possible than our ascent in leaving the river but we descended in safety 5 or 6 miles further, are again encamped on the Gila, where as yesterday, we have caught an abundance of fine fish, and find the grass tolerably good. In consequence of the bad road today, the howitzers have not come up, and it is feared they will not be able to overtake us tonight. Partridges and turkeys are abundant on the bottom of the river, also deer and bear and beaver in great

quantity. The soil in the valley of the Gila is singularly porous, resembling cold ashes more than earth—in marching along, our animals sink to the depth of 10 or 12 inches, causing a cloud of dust to rise. The surface seems undermined almost everywhere by small animals—what they are we have not yet been able to discover. We are still accompanied by most charming weather—a little cool at night, but not cold enough to require tents—we lie in the open air every night. Marched about 19 miles today. 361 miles.

October 22, Thursday.—The howitzers did not get in until this morning at 9 our starting was therefore deterred until 10:00, and an excessively rough day's march we have had—not quite so bad as yesterday, but most fatiguing and laborious for our animals. The grass continues good and our animals in consequence look pretty well—in 10 or 12 days the grass will become scarce, when it is feared animals will give out by tens and dozens at a time. We got into camp late—in consequence, no fish will be caught this morning. We are encamped on the bluff some 150 or 200 feet above the level of the river. We have seen but little of the river in the course of our day's march—left it about noon, and did not see it again until getting into camp—left to the right of us, keeping at the distance of from 2 to 4 miles from it. It is necessary to leave the river in this way because of the impracticability of marching along its bank—it passes frequently through "Kinyins" or gorges which do not admit of a man on foot passing through them. Our guide Kit Carson who passed over this route about two weeks ago, left 2 mules which had given out—they were found today, well rested, and in condition to commence the return march to California. Capt. Johnston met with bad luck today in losing his pack mule, with his bedding, and some other effects. Would to God I could know at this moment how my beloved family are doing—ignorance with respect to their condition, keep me restless and discontented. Could I hear from them occasionally, I should keep on my weary march with contentment—could I take just a peep at my dear little family, see my children gathered around their beloved mother, and all well and happy—God grant they are

more cheerful than I am. The view before me is beautiful beyond description—would that my little wife could be seated near me for a few moments—what infinite enjoyment we would derive from gazing at scenery about me—but far, yes, far is she away from me, and in her absence I enjoy—

"I only know that without thee
the sun himself is dark to me."

Marched about 18 miles—the weather is delightful—a little hazy, resembling our Indian summer, with a fresh breeze from the south-east. My wife and my children have scarcely been absent from my mind throughout the day. 379 miles.

October 23, Friday.—Capt. Johnston started back early this morning in pursuit of his lost baggage and mule—will not overtake us until tomorrow evening. Marched 17 miles today—having descended into the bottom of the river a few minutes after leaving camp—continued on the bottom throughout the day—found the route excessively dusty, but better in every respect for our animals than any day since leaving the Rio Del Norte. Passed foundation ruins of an old settlement, whether of Indians, Mexicans, or Spaniards, or of the old Aztec race could not determine—found 3 kinds of pottery not manufactured or used by any Indians that frequent this part of the country at the present day, from which we infer that these are the ruins of habitations constructed and used by a people who inhabited the country at a very remote period. It can scarcely be believed that this sterile region was ever inhabited by a people differing much from the savage race now found here, the country does not afford resources for a civilized population. The soil is sterile beyond conception, producing the cactus in every variety, and in great abundance, but nothing else save a sparse growth of grass, which though scarce, is of an excellent quality—as a stock raising country it might have been settled at one time, and maybe settled again, but nothing else I feel assured. It is supposed by some that the United States will place a high value on this country, as affording a highway from the United States via New Mexico to California: but it is my opinion that a roadway

is the last purpose to which this country will ever be applied. It is with difficulty a mule can make its way through it—as for wagons, if they ever reach California it must be by a route entirely different from the one we have traveled over. The country is healthy to a degree far surpassing in this respect all parts of the United States and perhaps all other parts of the world—there never was a purer atmosphere than I am breathing at this moment, but having said this there is nothing more to be said in favor of the country. Invalids may live here when they might die in any other part of the world, but really the country is so unattractive and forbidding, that one would scarcely be willing to secure a long life at the cost of living in it. 396 miles.

October 24, Saturday.—Stay encamped today that our poor animals might have a little rest, of which they stand greatly in need. Captain Johnston got into camp about noon having found his lost mule and baggage. Last night was cooler than we have yet had it.

October 25, Sunday.—We have marched today about 20 miles —greater part of the time on the bottom of the river, then taking the hills marched several miles over precipitous hills and deep ravines, and are encamped on a high hill which enables us to see the course of the river for miles. Our guide promises us a rough road tomorrow, and judging from the prospect now before us, we shall not be disappointed, for never did the eye rest upon a more broken surface than that lying about. It resembles nothing so much as the ocean after a storm, the hill tops take the shape of the caps of waves, and the whole country around presents the appearance of the ocean when greatly agitated. This is the Sabbath of our Lord, and oh! how I wish I could say at this its close, that I had passed it as becomes a Christian. Had I confined my thoughts to pure and holy subjects, I should feel I had spent it properly, but I find it difficult in riding along to control my thoughts—they fly from one subject to another, without restraint, and are as irregular in their course as my mule Betsey in her efforts to get over this broken surface. My mind is generally bent upon my beloved wife and children, picturing to myself their whereabouts, and the circumstances that

attends them. Not infrequently, I fancy myself about returning home, just in sight of all the world holds dear to me, and to embrace them, and to lavish caresses and affection upon them, but I awake too soon from these agreeable reveries; my poor old jaded mule makes a stumble, and I am roused up to find myself in the veriest wilderness in the world, and then the sad thought comes over me, that I am far away from my little family, and that each day widens the distance, but may I not be with my precious wife and children in less than one year? God grant it, but I may not! Saw today a horse and mule which had been left by our guide a few weeks ago —they had become well rested, and were so wild, they could not be caught. Capt. Johnston has not yet come into camp, having gone in pursuit of the horse. We have seen today innumerable partridges, more covies, and more in a covey than I ever saw in the same space in any part of the U. States. The valley of the Rio Gila is full of these partridges—their plummage [*sic*] is different and more beautiful than our common partridge—its note is also different—the flavor of the bird is precisely the same. 416 miles.

October 26, Monday.—I shall not attempt to describe the route we have passed over today. I have no language to convey even a faint idea of it. Could we have foreseen so much difficulty it would have been better to have retraced our steps 20 miles, to have taken another and more practicable route. From the moment of starting until we dismounted at our present camp, our poor animals were stepping over and among rocks of great size—some fixed, but most of them loose, and then the steep hills and deep gullies were very frequent. We were in the saddle about 8½ hours, and marched we supposed about 16 miles. The Rio Gila in this part of its course runs through a narrow gorge or kanyon [*sic*] for many miles. It is impracticable to get through this kanyon—it was to get around it that we were compelled to make the march we did today. A much better route could doubtless have been found by crossing to the south side of the Gila at the point where we crossed it yesterday, about 10 miles above the upper entrance of this kanyon, and taking a course due west until striking the Gila again—by this

route, the broken country over which we have passed today, would be but some distance to the right. I will communicate this fact to any poor devils who like ourselves, I may find en route to California by this route. The country is basaltic every where—the whole surface of the bottom of the river is covered with a basaltic substance resembling lava—it is lava without doubt, and the whole country, from New Mexico to California must have been at a very remote period visited everywhere and continually with volcanic eruptions. What a curious sight to persons, who like ourselves, have been accustomed to the beautiful green prairies of our Eastern plains and cultivated fields. But for the climate of this desolate region, which is certainly unparalleled, 'twere better for it to be blotted out from the face of the earth. 432 miles.

October 27, Tuesday.—The howitzers not having come in last night, we remain in camp today that they may be brought up. Many animals were left on the road, some 8 or 10—given out from fatigue. Such another day as yesterday would dismount half the company. We are encamped just below the mouth of the Rio St. Carlos [St. Charles] which runs into the Gila on the north side. The Black and the Blue rivers enter the Gila on the north side, the mouth of which we could see from our route yesterday—also the gorge they made thro' the mountain on the opposite side of the river.[29] The grass at our present camp is decidedly bad, and in consequence staying here today will not benefit much our jaded animals. Had a few drops of rain last night—the first since leaving Santa Fe. A black cloud passed to the right of us in which there was thunder and lightening. As we were lying without tents, were fearful of getting a soaking. I must here acknowledge that I have no taste for this mode of life—it contains not a single charm for me.

[29] Both Turner and Emory are confusing here. Their Rio San Carlos is the modern Bonita Creek. In both his text and map Emory gives the names Prieto and Azul to Turner's Black and Blue, while on modern maps the Prieto is the San Francisco River, and the Azul is Eagle Creek. To deepen the confusion, there *is* a San Carlos River today which flows into San Carlos Lake behind Coolidge Dam and is the Rio San Francisco of Emory's map! See Ross Calvin (ed.), *Emory's Reports* (a reprint of Emory's *Notes*) (Albuquerque, University of New Mexico Press, 1951), 108 and notes 74, 76, and 86; 202–203.

There is nothing in the wild scenery about me to interest me for one moment. It is *labor, labor* from morning till night, up hill and down, over rocks and gullies. Sometimes clambering over precipitous cliffs, at other times descending a plain with a slope of 45° —rarely moving over a smooth surface. Is there anything in such employment to interest one, who has agreeable ties elsewhere? I think not! As for myself, I move along listlessly from morning till night, with my eyes generally fixed on the ground and my mind generally fixed on home, and its fond endearments. I sink into deep and pleasing reveries, imagine my wife and my children around me, and in momentary forgetfulness of, and blindness to the dreary reality, I am happy, but alas! I am too soon awakened. Some obstacle will present itself, such as a deep ravine or steep hill: the command must dismount and walk over, or my old mule will get into a cactus bush and founder awhile, or some mule will get its pack upset and come dashing towards the head of the column, waking up my old mule, who like myself, was perhaps dreaming, and so we go from day to day. Night comes on, we eat supper, smoke pipe, go to bed in the open air, sleep sound, get up at early dawn, take breakfast, and off again to repeat the day's work, and so on from day to day. I am fatigued, I am tired of this business. I wish it was over, and I restored to the bosom of my beloved Julia, who is doubtless bewailing my absence as much I am hers. How long shall I find it necessary to remain in the army is a subject that frequently presents itself to my mind. I do not determine on a satisfactory answer to it. Should I leave it once, I have apprehensions with respect to the practicability of obtaining a comfortable support for my little family. My predilections now are all for a retired and quiet life. I desire to be comfortably established: I desire to have the means of furnishing all the comforts of life to these dear creatures, whom nature, and nature's God, make dependent upon me. But beyond this I have no longings. As for elegance or style in living, if I know myself at all, such a state of things would be irksome, and how admirably are my wife and myself adapted to each other in this respect. May God in his infinite goodness and wisdom, so permit us to manage and arrange our

affairs, that on my return home, we may be able to select a mode of life more suitable to our tastes, than the one we now pursue. The above was written this morning: this dreary day, thank God, is near its close. Would I could say as much for this dreary campaign. The howitzers have been brought in, having been since 7:00 A.M. yesterday until now, getting over 16 miles: what a country and to what purpose can it ever be applied. I wish there was a railroad through it, and at the rate of 60 miles an hour was passing over it, but let patience and perseverance do their work, they accomplish wonders. I wish I had more of these virtues—just as much as my mule Betsey, who does her work thro' this rugged country just as cheerfully as though she had a daily breakfast and supper of hay and corn: poor Betsey, will you ever taste of these again! I fear not: they tell me you too must give out, and be left to die before we reach California. Not if I can help it. You have been faithful to me, and I will do my utmost to save you from such a fate. If I have omitted to mention it before, I say now for the information of no one but my dear little wife, that centipedes and tarantulas abound in this region. We have seen several of the former, and many of the latter—a tarantula was found today large enough to cover the palm of one's hand. I sent it to Lt. Emory, Topographical Engineers. A strange man this Lt. Emory, beset with one mania, a greediness after immortality—in other respects a clever enough sort of man. I am disappointed in not finding him an agreeable person to be associated with—his assistant Lt. Warner is just the reverse—good natured and sociable.

October 28, Wednesday.—Marched today about 21 miles, all the time on the bottom of the Rio Gila, which in consequence of the accession it has received from the tributaries mentioned in our last day's travel has become a much more rapid and deep stream—the water is not so clear as when we first struck it—must have been colored by the Black and Blue rivers. A portion of our route today abounded with the partridges peculiar to this country—never were partridges so numerous as in this—in the distance of half a mile we must have seen today from 800 to 1,000. Since our

arrival on the Gila we have occasionally seen the foundations of habitations which may have existed several centuries ago, but the evidences were so imperfect until today, as to admit of some of us being incredulous as to the fact, whether or not they were the remains of human habitation. Today not one of us can entertain a doubt on the subject: the square and oblong shape of the buildings are distinctly marked, and the stones placed with a precision and regularity which exhibit an architectural taste and improvement far superior to anything found at the present day among the savage race of this country, or east of the mountains. The valley through which we marched was much the widest we have seen on the Rio Gila, and from the ruins we have seen it may have accommodated a population not less than 12,000. Pieces of pottery were extremely abundant about these ruins and indeed might have been picked up in all parts of the valley. At one place we found many cedar posts still standing, which must have been standing at least 3 centuries—the most remarkable example I have ever heard of, of the durability of cedar. To the left of our course today a very high mountain range lay some 10 or 15 miles from us—throughout the day it has been covered or rather capped, with clouds, and it appears to have been raining incessantly. This is the highest mountain we have yet seen.[30] Large trails have crossed our route today, leading towards Sonora from the Indian country, lying north of the Gila—on some of these trails fresh tracks of horses and mules were visible, as if Indians may have passed over them a few hours before. It would be great good luck to meet a few Indians just now, as they might be induced to guide us thro' a district of country which we shall pass in a few days, and in which we expect great difficulty in finding water without guides, besides we might procure fresh animals from them. 453 miles.

October 29, Thursday.—Marched about 22 miles, and encamped on the bottom of the river. We have had a good road today—better than any day since leaving Santa Fe. Grass is becoming bad—only at intervals, and then of an inferior quality. After marching about

30 Probably either Mount Graham or Mount Turnbull.

8 miles this morning we fell into a large trail leading from the direction of Sonora, diagonally across the river to the range of mountains, which cover its north side. This trail appears to have been much traveled, and is doubtless the main route by which the Kiataro Indians,[31] who live in that range of mountains, take the horses, mules and cattle which they steal from the inhabitants of Sonora. We are informed that great numbers are stolen every year by them, and to such an extent have their depradations been committed for some years past, that the Mexicans on the frontier of Sonora have become comparatively destitute, and in many instances have abandoned large ranchos, which were contiguous to the Indian country. These Indians, like the Apaches, of which nation they are said to be a part have been at war with the inhabitants of the Dept. of Sonora for some years, since which time they have improved in condition in the same ratio that the Mexicans have declined—and as the Indians are doubtless fully sensible of the source from which they derived their present prosperity, it is not probable they will cease committing these depredations until a more enterprising and energetic population gets possession of Sonora, who will chastise them properly for their aggressions. It is not probable they will permit us to get a sight of them during the time we will be passing through their country. The valley of the river continues wide, and the soil of the same light porous character: in riding thro' it our animals sink at almost every step to their knees, causing great fatigue and great impediment to their progress: to the depth of 6 inches under the surface, the earth is everywhere perforated with holes, undermined by innumerable small animals which resemble the ground rat, and is doubtless the ground rat of this country. Saw a mule today which had doubtless made its escape from the Indians, having been alone for some time it had become extremely wild, too much so to be caught. Oh this country of cactus, mesquite bush and wild sage, remarkable for sterility and its broken mountainous surface, where it scarcely ever rains and where no verdure is visible except in the branches of cotton wood trees. When, oh,

[31] Turner's spelling is one of several variants used to describe the Coyoteros Apaches who at that time lived in this part of Arizona.

when shall I say goodbye to you—would that the time had arrived; of one thing I feel assured that no *earthly* power can ever induce me to return to it. I would rather be way down with poverty in the U. S. than to live in the greatest luxury and wealth in this country, and when I say this country I mean the whole country lying between our beautiful verdant prairie and the coast of the Pacific. No early inducement could ever cause me to bring my wife and children to such a country, and without them even the fairest portion of the earth's surface would not be agreeable to me, but of such a place is this Rio Gila, it is scarcely fit to be the abode of the savages, who live near its banks. 475 miles.

October 30, Friday.—Made today about 21 miles over a good road, a large trail, the same we marched on yesterday, generally on the bottom of the river, occasionally crossing points of hills which make in close to the river. A cloudy, cool day, most propitious for making progress: just before getting into camp, met suddenly in turning the point of a hill two Indians, both old men, perhaps with defective sight, for they were evidently surprised and in finding themselves in our power, exhibited much alarm and uneasiness. We endeavored to prevail on them to come into camp with us, hoping that we might be able to allay their fears, and induce them to seek their people, with whom we might trade for fresh animals, but they persisted in refusing to come into camp with us, and appeared as stupid, on the whole, and so difficult to communicate with, that the General determined to lose no time with them, but to have them go their own way and continue our route. These were the most meagre, poor, scrawny, abject, starved looking creatures I had ever seen in human shape, and unless they are the very refuse of their tribe, the Indians who inhabit this country are greatly inferior in appearance to those who roam over our prairies, but how can it be otherwise when it is remembered that their only subsistence is obtained by stealing from the frontier inhabitants [Mexicans, themselves half-starved] of the Dept. of Sonora. Oh! human nature in what strange figures are you sometimes represented! We have had a high peak on our left all day, distance from us about

10 to 12 miles—the country around preserves its broken and barren aspect. My good and faithful mule Betsey, this has been a day of rest for you, that is, you have been permitted to follow us loose—the first day since leaving Santa Fe that you have not been rode. Betsey's water works are a little out of order [illegible] this strange indulgence, maybe she will be restored in a day or two and then away we go again. Betsey and I are inseparable companions. 496 miles.

October 31, Saturday.—Marched 9 miles, and are encamped on the San Francisco a small tributary of the Rio Gila, on its right bank. Propose to take a long stretch without water at this point. Our guide in passing along a few weeks ago found no water for 60 miles; by taking a route somewhat different, we hope to find water at convenient distances. Just after getting into camp today, two Indians made their appearance on a hill a mile from us. Capt. Moore and several others went out to prevail on them to come into camp, but were unsuccessful: they were afraid that we had some evil designs on them. These Indians on a former occasion were treated treacherously by a party of Americans, many of them having been most inhumanly killed[32]—since then, they have been suspicious, and to this, must be ascribed their unwillingness to come with us at this time: this is a great disappointment to us for the reason mentioned a few pages back in my journal. We are at an excellent camp for grass, and surrounded by the same broken wild country, through which we have been winding our weary way since leaving the Rio Del Norte. My wife, oh my sweet wife! how has my mind dwelled upon thee, and our dear little ones this day: could I only gaze at you all for a few short moments, to see that you are well and cheerful, and that all is passing well with you, with what cheerfulness would I recommence this monotonous march tomorrow, but I have confidence in God's goodness to us all—He has preserved us thus far—is it expecting too much to hope that he will

[32] This was the treacherous massacre of a number of Apaches, including the chief Juan José, in the spring of 1837 by a gang of Americans led by James Johnson. Details are given in Josiah Gregg, *Commerce of the Prairies* (Norman, University of Oklahoma Press, 1954), 205–206.

continue his blessings to us. I know my unworthiness, but yet I pray to become a more worthy recipient of God's providence. My prayer will be heard, I feel assured that it will be, and that I shall yet live to be a good Christian and exemplary Catholic. My first desire is to be a conscientious member of the same church with my beloved wife—that we may offer up our prayers together at the same altar. 505 miles.

November 1, Sunday.—We have marched today about 17 miles —the first 6 miles we returned on the Rio Gila, struck some 5 or 6 miles above the point at which we left it yesterday—the animals were watered, canteens filled, and arrangements made for a long march without water. We struck at once into the hills almost at right angle to the river, for the purpose of avoiding an impassable kanyon through which the river flows a short distance below where we left it. After leaving the river we wandered through dry ravines and up and along the stony sides of precipitous hills—after wandering about 10 or 12 miles came to a ravine where there was water enough for a camp—this place has been much resorted to by the Indians—marks of their having been there recently—remains of a rudely constructed steam bath. We are encamped a half a mile from this water, having been compelled to leave it this far, in order to get grass. The cactus in our march today has assumed a new and very strange character. It grows in a straight shaft to the height of 30 feet with a diameter of 2 and 3 feet—branches occasionally spring out midway up this shaft, all at the same elevation, presenting at a distance the appearance of a drop candle stick inverted. The Sabbath has again come round, and I am ashamed to say it had not occurred to me until I opened my journal. Ah! how little is there in this wilderness to remind one of this holy day. We wend our weary way on Sunday as on any other day. I feel happy, and it is a source of great satisfaction to me that my wife and children are within the sound of the church going bell, a sweet sound which these rocks and valleys never heard, nor do they smile that a Sabbath appears. 522 miles.

November 2, Monday.—The Howitzers did not reach camp last

evening—supposed to have been left back about 4 miles. Lt. Davidson started back for them this morning, but was taken sick on the road, and was compelled to return to camp. Just after sunrise this morning several Indians made their appearance on the top of a hill nearby. Our guide, Mr. Carson, went to them, and after much persuasion succeeded in getting one of them to accompany him into camp. The General made him some trifling present, whereupon another ventured in, and then another: one of them could speak the Spanish language sufficiently to be understood, and through him the party was given to understand that we were anxious to obtain a supply of fresh mules, and if they would bring them in, we would exchange blankets, knives &c. for them. They seemed much pleased at the proposition, and immediately assented to it, promising to meet us at a point some 6 or 8 miles distant on our route towards the Pimeaux, and to bring in a large number of mules to trade with us. One of them consented to guide to the appointed place. So off we started, leaving all the Indians to go after their animals to trade with us, except the one who was to be our guide. We marched some 7 miles, around the point of a mountain, over an excessively rough road, and entered on a beautiful valley where we found water and abundant grass, and where we shall await the arrival of the Kiataros with their mules—hope not to be disappointed, as our animals are giving out daily, and we have still 4 or 500 miles before us. The weather continues clear and dry—never have I witnessed such a continuation of such weather. We may say that not one drop of rain has fallen upon us since we left Santa Fe—a cloud has occasionally made its appearance for a few fleeting moments, but it is again clear, and the day is clear, mild and beautiful. The heavens are certainly beautiful above us, but the earth's surface around us, presents the most forbidding, dreary, and in all respects uninteresting aspect that the mind can conceive. But whether night or day the heavens preserve their serene and beautiful appearance. But this is all a strange existence for me. I constantly feel as though I were in a dream, to be thus surrounded day after day with a wilderness, not one familiar object in nature except the sun, the moon and the stars—all else is wild and strange

to me, and to be denied too all intercourse with those dear creatures for whom alone I desire to live, oh! it is all queer to me, and I wish from the bottom of my heart I had seen the end of this toilsome march, and were once more restored to my Julia, and our darling little ones—life is too short thus to be wasted away. The Century plant has been abundant on our route today—many of them bloomed during the past season, and the stalk of the flower from 8 to 10 ft. high still standing. I plucked a thorn from one of them for my wife—she may use it for making islet [*sic*] holes. 530 miles.

November 3, Tuesday.—We are laying by today, doing our utmost to trade with the Kiataros for fresh mules. A party came in early this morning agreeable to promise with a few mules—the business of trading is going on with what success is yet to be determined. A religious, devotional feeling has come over me today —would to heaven it would more frequently visit my wandering mind. It is a most satisfactory feeling—a pure, a pleasure giving sensation, to feel a full responsibility to my Creator: to feel a deep reverence for the Deity, to see God in the blue heavens, in the floating clouds in the Earth's surface, in every object about you, to have pure thoughts and pure sensations, to feel that you are amenable to our Creator that His eye is upon us, and that a life of piety and purity will enable us after this life to meet and converse with Him face to face. Oh! this is a delightful sensation—would to God I could be at all times deeply impressed with but human nature is frail, and the mind will wander occasionally to impure subjects. Well, our Indians have finished trading and are gone, leaving with us but 7 indifferent mules—a much worse business than we had hoped to do with them. These Indians are a worthless, squalid looking set—their physical appearance greatly inferior to that of any Indians I have ever seen—countenances for the most part pleasant and more indication of amiability of disposition than I have before observed with Indian faces. They are very destitute—and for the most part naked—both men and women. And whoever comes among them with the view of trading, I feel assured take leave of them with as much disappointment as we shall do. The

Howitzers did not get into camp last night, but arrived after noon today, much shattered—the business of repairing them is now in progress—hope to have them in readiness to recommence the march at 8 tomorrow morning. My sweet Julia, are you thinking of me at this moment as I am of you? Doubtless you are, and just as disconsolate and impatient as I am—May God extend to you His blessings and His grace, and grant you a safe passage through the severe ordeal to which you are soon to be subjected; and our darling children, may it please Almighty God also to watch over them and preserve them in His most holy keeping. I sometimes fear I am too much attached to these dear creatures, for should it please God to take one of them from them [*sic*], methinks I could scarcely sustain the loss. It is really cloudy this evening, and were I in a country where it had ever rained, I should expect a steady rain before morning.

November 4, Wednesday.—Started about our usual time—¼ before 8—taking a course due west, reached the trail by which our guide, Mr. Carson, had traveled a few weeks ago. Soon came to a spot where water might have been obtained by digging with spades—having marched about 12 miles before reaching this point, much of the road very bad for the Howitzers, the General left word for the Howitzers to remain here all night, while the rest of the command would continue on to the Rio Gila, some 15 miles further. After crossing a hill, and winding for a few miles through a dry, sandy ravine we opened on a wide open valley where there were several large trails coming in, making the road most excellent. In this valley following a course about due south we descended to the Gila, and for the first time in 4 days, our animals got their fill of good water, we ascended the river, and encamped on its right bank—find the grass by no means good, but by permitting the animals to run loose they will do pretty well. In approaching the river we saw many fresh tracks of Indians, mules & cattle supposed to have been made by herds of animals recently stolen by the Indians from the settlement of Sonora. Should this country ever get in the possession of the U. S. there will be much difficulty in keep-

ing these Indians in order—their only subsistence is the stolen cattle etc. from Sonora, and if they are cut off from this resource I cannot perceive how they are to live—the U.S. may buy them up with annuities, and cause them to be subsisted, and in this way purchase permanent peace with them—they live in such a rough country their hiding places are in such fastnesses that a war with them would be almost as endless as was the Florida war with the Seminoles. Saw today a new variety of cactus—we call it the moss cactus from its resemblance to moss or to being covered with moss. I now regret not to have gathered the seeds of the different kinds of cactus I have seen. I might have done it without inconvenience, and doubtless they would grow in the U. S. The heavens have been overcast today, looking like rain, but we do not expect it. Marched today about 24 miles. Howitzers will not overtake us until tomorrow night. 554 miles.

November 5, Thursday.—Started an hour later than usual, the Howitzers being still behind, expected to make a short day's march, and wait if necessary for them. Descended the Gila 6 miles, then taking up a dry, sandy ravine, march about 10 miles, bearing at first due south and then towards the west—reach the Rio St. Pedro[33] a mile or two above its junction with the Gila, and encamped at the base of the hills on the west side, having marched in all about 16 miles over an exceedingly rough road. Saw orchards of the tomb-stone cactus, more than on any previous day, and partridges in their usual abundance. The St. Pedro is a small stream, clear water, and with the usual growth on its valley as found near all the streams in this section of country—the valley of this stream is quite wide and covered densely with weeds and scrubery [*sic*] Each day brings me a little nearer to the end of this toilsome march, and I rejoice at evening that another day is gone, and that I am by so much time nearer to my beloved Julia and children. I long for a state of things when I may not rejoice at the passage of time—it bespeaks a cheerless period when one longs from hour to hour for the rapid passage of time—so it is with me now, and so it will ever

[33] This is one stream in the Gila watershed that retains the same name, the San Pedro. Turner's use of "St." for "San" was a common practice in his day.

be with me when separated from my devoted little family. My dear little boys Tom and Willie, what would I give to look at your laughing faces now—the features of which I have not a trace left on my mind. My dear little infant daughter, are you still spared to us—this dreary thought is often present to my mind, and when shall I be relieved of anxiety on this score: Months, yes months will elapse before I shall know whether I have a daughter or not or whether my poor little Julia is dead or alive; but everything is in the hands of an all-wise God, and I have the utmost confidence in His justice and goodness. Our guide pointed out to us a peak near which is a Mexican garrison of Touson [*sic*].[34] 570 miles.

November 6, Friday.—Remained in camp today that the Howitzers might overtake us—they arrived about 3:00 P.M. As usual on these rest days I have laid [*sic*] in my tent, reading old papers and thinking of my dear little family, and of many things which may perhaps never again find entrance into my mind—at least it is to be desired they should not. I am naturally lazy, and particularly so on these campaigns. When engaged in anything in which I am interested, I am active and industrious, but on these plodding marches I go listlessly along, thinking rapidly, but doing nothing not indispensable to progress. Sometimes I get extremely impatient to get to the end of the march. I fret and bother most unnecessarily and ridiculously, as if I could cause time to pass more rapidly from exhibiting impatience. Oh, foolish human nature, how frail thou art, how puffed up with thine own importance; yet how impotent, how unimportant except in thine own estimation. Would that human beings were more sensible of their littleness—they would scarcely boast or swell themselves to such windy dimensions as they frequently do. To lead a quiet, amiable life is my desire—to live in peace and amity with all my fellow beings doing wrong to none, unworthily suspecting none. Scandalizing no one, dealing out impartiality and justice with whom it may be my lot to transact business.

November 7, Saturday.—Started at 8:00 A.M. and marched 18

[34] Tucson.

miles to our present camp, keeping in the valley of the river nearly all day, crossing and recrossing it. Nothing worthy of mention occurred except that 3 Indians seen on a hill near the road were induced to come into camp, and are now sitting at our camp fire—they are Apaches, but a subdivision of that nation, different from any yet seen by us, speaking another language, and in all respects presenting a different appearance: they tell that there are many mules among their people, and that some will be brought in for trade with us—don't believe it, neither do I believe they have many animals of any kind—they are in every sense destitute, of this I feel assured, for there is scarcely subsistence in these sterile mountains for a large number of animals. We are just at the entrance of another kanyon, being the 4th we have encountered on this never to be forgotten stream—this one we shall march through, following the course of the river in all its windings—the distance is said to be about 25 miles, then we emerge on a more open country about 50 miles above the Pima village. After getting out of this kanyon we are promised by our guide a good road into California, still some 400 miles distant, but as for grass, our guide says there is literally none. What is to become of our poor animals, and without them, of our poor selves! The prospect is dreary in the extreme —our only hope is to find things better than our guide has represented: although thus far we have found him truthful and trustworthy—but is there no grass along the margin of so large a stream as the Rio Gila—*nous verrons*. It is quite cloudy this evening, threatening rain, but it won't—I know it won't—it cannot rain in this country. I feel almost assured of this, altho' there are evidences of its having rained in torrents along the valley of the Gila at some time or other: the drift in some places is seen some 30 or 40 ft. above low water mark. 588 miles.

November 8, Sunday.—Had quite a rain last night—the first since leaving Santa Fe. It took us all by surprise, and not until it commenced to pour did we think there would be a shower. The weather was clear & beautiful again this morning: a little cool, but a delightful freshness. We delayed our departure from camp an hour

later than usual to admit of blankets &c. being dried—then striking into the kanyon, and winding about, crossing & recrossing, the river some 10 times, halted after marching 15 miles to give our animals the only grass said to be on the route for many miles—here we are for the night, & most sad, gloomy looking place it is; in any other country it would be distinguished as being destitute of grass—in this sterile country we have selected it as a grazing spot. What difficulties do we have to encounter, we who perform marches over such a country; how little do those who sit in their easy chairs in Washington, think or know of the privations, the difficulties we are daily, hourly subjected to. Even our anxious friends at home can form no idea of the trials & fatigues that we undergo each hour in the day—wading streams, clambering over rocky, precipitous mountains, or laboring through the valleys of streams where the loose earth or sand cause our animals to sink up to their knees at almost every step—then, our frugal meals, hard bed, & perhaps wet blanket. This is soldiers fare, but I am sick of it, & have power no longer to endure it willingly, particularly when we get no credit for it. Unless we are fortunate enough to get into a fight before reaching California, and be successful in it too, our laborious service in marching over this country will never be appreciated. I hope, however, to get the approbation of my own conscience & the satisfaction resulting therefrom, viz: the happy reflection of having performed all my duties faithfully. We are encamped near a most singularly shaped mountain—It is more unique in its appearance than any mountain yet seen by us—it is about 1 mile west of us, & just at the end of the kanyon, through which we have been journeying today. 603 miles.

November 9, Monday.—Started at our usual hour, & in the course of a mile emerged from the kanyon, through which we had been marching the last day, upon an open country, promising good roads & easy progress for our Howitzers. Marched 17 miles & encamped on a good spot for grass, something we had no expectation of finding, having been told by our guide we should find no grass before reaching the Pima Village, above which we now suppose

ourselves to be 30 miles. We also found good grass at noon today, indeed, for grass our march today has been more favorable than for many days. We only hope we shall be as agreeably disappointed tomorrow, the next day, & so on to California. We are clearly out of the mountains, & a happy relief it is that there shall be no more clambering over rocky hills and deep gullies, fatigueing our poor animals, & disgusting to ourselves. I felt more cheerful today than for a long time—the weather is fine, clear & cool. A heavy frost this morning. 620 miles.

November 10, Tuesday.—Marched 20 miles & are encamped near the Pima village. Several Pimos & Maricopas have come into camp offering hospitality & friendship to us—they are a more civilized Indian than any we have seen—seem wholly unlike savages except in their color & dress—we have seen no women as yet—the men wear a cotton blanket made by themselves, a thick substantial material, which doubtless protects them sufficiently from the cold they experience in this country—they brought in numbers of watermelons, dried pumpkins, beans &c. for trade with us. We shall reach their village about noon tomorrow, & doubtless will see things among them strange and altogether new to us. About midday passed the "Casa of Montezuma"[35]—a large edifice built ages ago, Capt. Johnston visited it, & took a sketch of it. The Pima Indians can give no satisfactory account of the period at which this house was built, or by whom it was occupied. They have a tradition among them in relation to it somewhat to the following purport: that it was occupied by the first man, who was the son of a woman —a most beautiful woman, who lived on a neighboring peak, & who when lying one day on her back, felt a drop of water to fall on her womb, whereupon she conceived & brought forth this son, who was the first man, & who begot a numerous race of men, who tilled the ground, & provided for all his wants, & did homage to him in this house—that his progeny were an extremely wealthy race, & occupied the valley of the Rio Gila for a long distance—ruins of their irrigating were very perceptible on our route today, showing

[35] The Casa Grande National Monument, a little north of present Coolidge, Arizona.

that they must have cultivated the ground to a considerable extent. We have traveled today through a very extensive valley, capable of being irrigated for cultivation—it has occurred to some of us it would be a suitable place for the Mormons to establish themselves.[36] We have had a delightful day—a little too warm for comfort. We find the grass quite green & good—infinitely better than we had any expectation of finding. 640 miles.

November 11, Wednesday.—A beautiful morning—set out under the guidance of a few Pimas who would conduct us to their village, now about 8 miles off—met the principal chief after marching a few miles, who met us most cordially, & invited us to pass a day in his village to give ourselves an opportunity of trading with his people for such articles as we might require—he rode ahead of us & pointed out the ground where we had better encamp—this was several fields from which the corn &c. had been gathered, enclosed by imperfect fences made of cotton wood poles, set up right in the ground, with smaller branches of cotton wood entwined between—The Genl. determined to accede to the proposition of the old chief, & after encamping the business of trading for corn meal, flour, beans, pumpkins, melons &c. commenced, succeeding admirably in obtaining an abundance of everything except mules & cattle —it is feared we shall not obtain a supply of them—the consequence is we may have to depend upon our poor mules for fresh meat—*nous verrons!* These Pimas are a good harmless people in appearance, & more industrious than I have ever found Indians—they have all the necessities of life in sufficient abundance, & all produced by their own industry—they raise cattle & horses; corn, wheat, beans, melons quite enough for their consumption, & to furnish supplies for parties of strangers who may pass this way. Our supply of corn meal & beans was abundant, & there was much more for sale—they also raise cotton and manufacture a very substantial blanket of that material—they live in very rudely constructed houses resembling more what is termed a root house in our coun-

[36] Turner was prophetic here; he was less than forty miles from the future site of Mesa, Arizona, where a large Mormon Temple would stand in a region heavily populated by members of that faith.

try than anything else I can think of—their women, like the women of all savage nations, seem to perform the labor, & are not more prepossessing in appearance than the average woman. The men generally have kind, amiable expressions—never did I look upon a more benevolent face than that of the old chief—he is a man of about 60 years of age—spare & tall, & exhibits more of human kindness in his face, air & manner than I have ever seen in any other single individual. Marched today about 8 miles, found the road extremely dusty. 648 miles.

November 12, Thursday.—Started at 9:00 A. M. later than usual to give Major Swords an opportunity of doing something more in the way of trade—purchased one ox, and received a promise that several more would be brought to our present camp this evening, which promise they have kept as I see some 5 or 6 head of cattle being brought in now—We were out of the Pima village at noon, and soon arrived at the first houses of the Maricopa's village, which is situated lower down on the River Gila. The Maricopas like the Pimas seem to be a well disposed people most kindly disposed towards us, offering us hospitality and friendship as we approach. They appear to have the same habits and customs with the Pimas, and resemble them in many other respects, though in features totally different. The Maricopas formerly lived near the junction of the Rio Gila with the Rio Colorado, but some 5 or 6 years ago moved up, and have become neighbors and allies of the Pimas—their chief sent his interpreter to meet us to show us the way to our camp, and to say that he would visit us this evening, is expected every moment—we have had a dusty march today, the soil of the plain over which we traveled having been of a porous light character, which being so rarely watered is as light as almost the finest flour, and rises from the feet of our mules as we march along as though we were marching through a bed of flour or ground plaster of Paris. We are encamped on a spot where the grass is excellent, wood sufficiently abundant, and water a short distance off. We have left the Gila several miles to the north of us, and will not see it again for 2 days. We are now encamped in a slough that

empties into the Gila. Tomorrow we shall commence a journey of 40 miles in which we shall find no water; at the end of it we are again on the Gila. It is said to be practicable to follow the course of the river, but by taking this cut off we save about 60 miles. Some delightful watermelons were presented to us today as we marched along—we have marched about 15 miles. The weather has been excessively warm today—quite as warm as it is with us in the U. S. in the month of June. 663 miles.

November 13, Friday.—We shall lay by here today until about noon, when we shall start out and proceed 20 miles then lay by until the moon rises about 3:00 A.M. and continue on and complete the 40 miles without water. The Maricopa Indians are pouring into our camp. (Tucson is the way to spell the Mexican Garrison about 100 miles east of us.) We hope to be more successful in getting beeves from them this morning than we were last evening. This is a charming day, and as I lie in my tent looking up to the clear blue heavens my mind reverts to pleasant associations: My family group passes before me, and in the labyrinth of reverie into which I fall, I lose sight of the reality passing around me, and I enjoy the present in imagining it the past or the future. What must be the life of a man without agreeable family associations! In what can consist the happiness of an old bachelor! without a wife, and without children, what agreeable associations does his mind rest upon? Is he a philosopher? his mind must occasionally relax, and seek relief from the abstract subjects which principally occupies it—then what does it rest upon? Upon sensual gratification, I have no doubt; eating, drinking, or some other indulgence more criminal; but with a married man, who possesses a loving wife and sweet children, after the business of life is ended for the day he seeks the society of his fond household, and in lavishing upon them his love and affection, he experiences an infinite and incessant pleasure —whether present or absent they are a source of enjoyment to him: when present, to gladden him with their society; when absent, to enable him to rejoice in the assurance that though not with him, they love him and long for his return. God be praised for having

blessed me with a loving wife and sweet children. Started ¼ past 12 M. and continued marching until an hour after dark, about ½ past 6 P.M. The first six miles through a light porous soil, a saline crust, which caused it to be very laborious for our animals—then getting up on higher ground found the road good, but the surface perfectly destitute of grass—not a blade was visible for a distance of 18 miles. When it became too dark to see the trail we halted, tied up our animals to mesquite bushes, there being neither water or grass for them. Got suppers, and went to bed about 9:00 P.M. to rise at 3:00 A.M. tomorrow having marched about 20 miles. Before leaving our last camp the Maricopa chief came in—a venerable looking old man about 65 years of age—he seemed somewhat disappointed that we have not passed through his village, and made many assurances of good feeling and friendship towards us. 683 miles.

November 14, Saturday.—Rose at 3 and started at 4:00 A.M. an hour and a half before day, continued on the plain we had marched on last evening; passed through a gap in a mountain and coming into another plain, continued on to the Rio Gila to arrive on its left bank at 10:00 A.M. march 6 miles further descending the river, and encamp for the night where the grass is quite good. Our poor animals have suffered much in the march of yesterday and today—several have given out, and were left on the road—having had no grass or water they exhibited much fatigue on reaching the river. Did not get breakfast until near 3:00 P.M. today, and in the last 24 hours have marched 46 miles—we shall remain here until after noon tomorrow, then proceed on our march. Our guide informs us we shall have no more grass before reaching the settlements of California, some 300 miles distant—A gloomy prospect for us as it is very questionable whether our already broken down animals can sustain this privation. But all things are ordained by God—as it was His will that we have come this far, may it be His pleasure that we proceed on and get through in safety. Oh! my God, would that I were more mindful of my indebtedness to Thee—would that I could feel at each moment of my existence my dependence upon

Thee, and offer up praise and thanksgiving for Thy numberless favors and blessings to me. Give me, Oh God! a grateful heart for Thy tender mercies to me and mine: "Our Father who art in heaven etc." 709 miles.

November 15, Sunday.—The General determined to remain in camp today to give our mules rest, and enable them to get their last fill of grass which is abundant where we are at present encamped, but of which there will be literally none for 3 or 4 miles to come, so says our guide Kit Carson. This is the blessed Sabbath —it has come again to find us some 120 miles nearer our destination than at its last visit. A hallowed day so I begin to regard it, and though no professor of religion heretofore in any of its various denominations, still, I cannot resist if I would, a devotional feeling on this holy day. Would that I had passed every Sabbath of my life as properly and profitably as I have passed this one. I commence the day by reading the morning prayers as contained in the dear little pocket manual my good mother-in-law gave me before leaving home—then I read attentively the holy Mass or Catholic service: this evening I have read over the Vesper service, and offered devoutly the prayers of the evening exercise. My thoughts have been turned during the day on religious subjects, and I have ardently desired repeatedly to become a devout Christian and a Catholic. I pray God most earnestly that this holy desire may never forsake me, and that I may be numbered among those who serve God with their whole heart and soul, following conscientiously the precepts of the holy Catholic religion. I have pondered today on the subject of leaving the army, and conclude it would be greatly to the advantage of my beloved family, that I should do so. Think I may be able to do so at the close of this campaign. In disposition and tastes, I am certainly better suited for a civil than a military community, the only difficulty in the way is the matter of supporting my family out of the army. May not another year bring about something favorable to me in this respect.

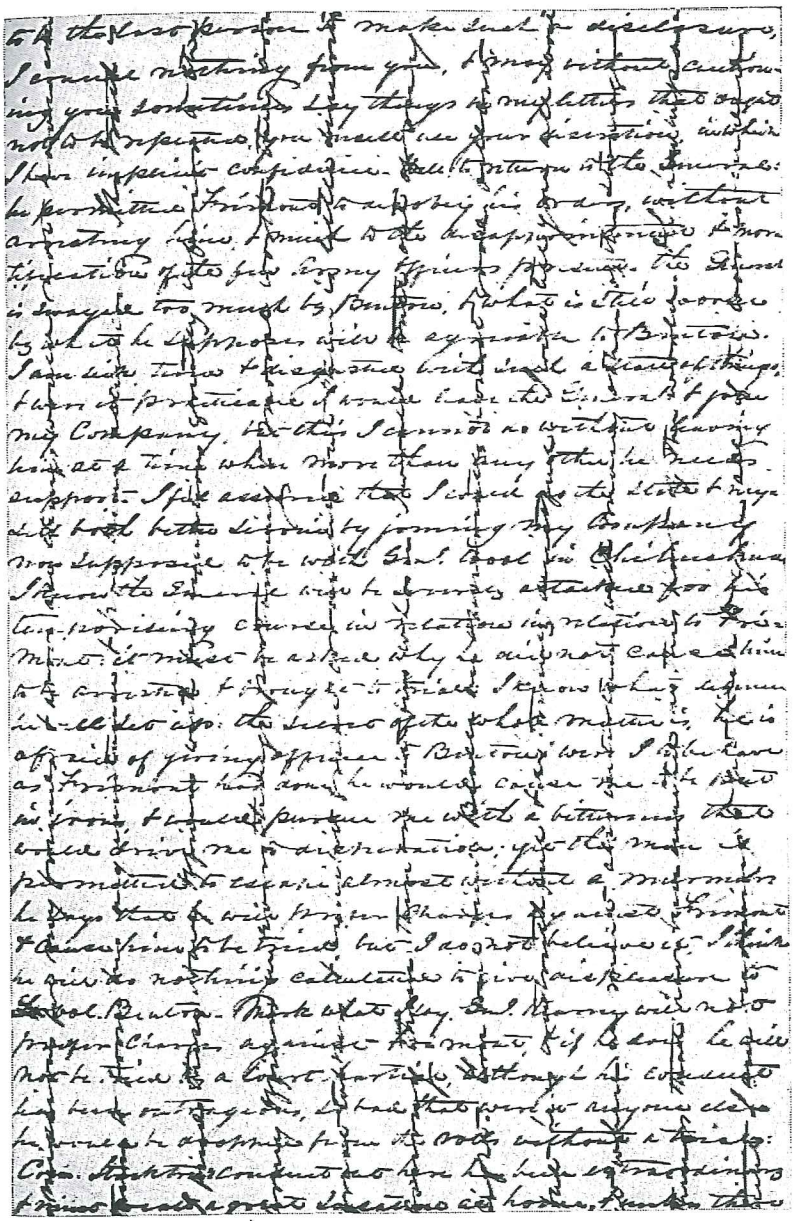
November 16, Monday.—¼ past 8 were in the saddle—marched over a level plain for about 11 miles, then halted for a half hour to

permit our animals to graze a little on an hermorphrodite grass—something between a coarse grass and a weed—they did not relish it much, but picked at it in the absence of anything else. We left the river bottom about noon to take a nearer route across some table land which extends into a bend of the Gila in this part of its course—found much black loose stone in passing over the table land, and at one place where there was an immense heap of this stone, larger than those on the plain surface, we found many figures worked on the larger stones of the heap—figures which were wholly incomprehensible to us, and which we suppose to have been drawn there by the people who ages ago lived in the valley of the Gila, the ruins of whose habitations are more visible in a great many places. Reached our present camp a little after 3:00 P.M. find no grass at all, but an abundance of cane which our mules seem to eat voraciously. A delightful day—somewhat cooler than usual—the road generally good. Made today about 18 miles. 727 miles.

November 17, Tuesday.—Had much difficulty in finding mules this morning—having got tired of the cane wandered off during the night, and many of them strayed to a considerable distance from camp before morning. A high wind from the north-west commenced at dawn of day, and blew incessantly all day—as our course was to the west, the dust was blown to the left side of us generally, and did not annoy us a great deal. Marched we suppose about 20 miles and are encamped on the right bank of the Gila, having crossed it just opposite for the purpose of getting grass or rather cane for our animals. The cane has agreed well with them thus far, that is none of them have been made sick by it, but it does not possess the strength of grass, and it is therefore doubtful whether they can continue to travel any length of time on it. We are beginning to experience great inconvenience from finding it necessary to leave the direction and the road on which we may be traveling to seek a camp on the river or near it, which it is necessary to do both on account of water and grass—none can be had off the bank of the river, except the mesquite bush and other thorny

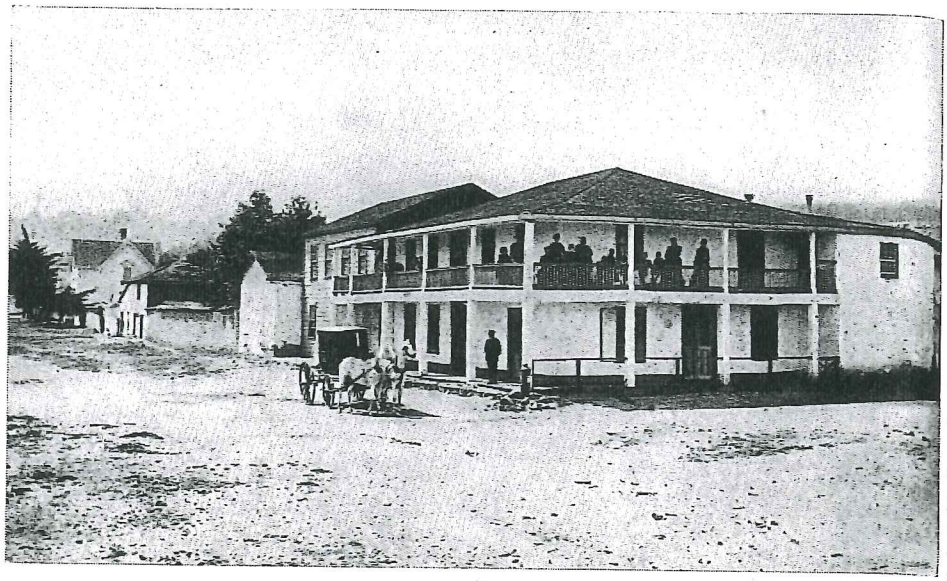
bushes and weeds—the surface is as bare off the river as a public road, and quite as destitute of verdure or herbage. I have felt perhaps more impatient and more fatigued today, with this monotonous work than ever. It is indeed discouraging to find ourselves surrounded by such scanty means of subsisting our animals, and yet to look ahead and see nothing but distance and gloom in the prospect. We have still near 400 miles to march before reaching our destination, and 90 of it will contain neither water or grass. The water fowl begin to make their appearance along the river today. Brants have been seen in great numbers, and differing in plumage to those I have been accustomed to see on the Mississippi River. They have white bodies with black wings. 747 miles.

November 18, Wednesday.—Marched about 20 miles over an excellent road— are encamped where there is no grass, or anything else for our animals—it is doubtful how far we will be able to proceed with this state of things—our animals are now in a half starved condition, skin and bone. I really do not perceive how they will get to California. The road today left the bottom of the river, and passed over a level sandy plain for 8 or 10 miles from which the mountain scenery was remarkably fine in front and to the southeast of us a beautiful chain of mountain range from north to south—at the distance of 10 or 12 miles from us on the south side of the Rio Gila, extending far in the direction of Sonora. On the north side of the Gila the mountain was much more irregular, and the country generally presented a much less champaigne [*sic*] appearance than that on the south side. At one place the broken surface appeared like a city at a distance, presenting very much the appearance of Brooklyn in approaching New York. Just after leaving camp this morning passed a pile of large rocks, on several of them were scratched the names of American trappers, Hacher, Maxwell etc. My dear little children, when shall I be permitted to see you again! My sweet boys, what would I give for an hour with you this evening! May Almighty God make this our last separation, my beloved little family. I have seen quite enough of the world. I desire to see no more of it. I long for a home—a quiet home—



Reproduction of second page of Captain Turner's letter to his wife, dated San Francisco, February 22, 1847. Note the crossed writing, which served to get more words on the page at a time when postal rates were high and in places where paper was a scarce commodity.

Courtesy Missouri Historical Society



Thomas O. Larkin House, Monterey, California, in the 1880's. This structure was both residence and headquarters of General Kearny while Captain Turner served as his adjutant in 1847.

Courtesy Bancroft Library

I care not how humble, so that we are comfortable and respectably circumstanced. 767 miles.

November 19, Thursday.—Started at half past 8 this morning, and marched about 20 miles over a good road—stopped at noon to permit our animals to browse the mesquite bushes—for there was not a spur of grass on the whole of our route today. Tonight we are encamped on the bottom of the river near its left bank, find a good deal of coarse grass in a slough nearby. Our animals devour it ravenously. In this kind of grass there is but little nourishment, and it will be impossible for our mules to do service much longer unless a favorable change takes place for them. The Gila is assuming a much more river like appearance—it has attained the width from 100 to 150 yards—and is in average depth about 4 feet—quite deep enough to float a steamboat—its valleys are wide, and but for the want of moisture would doubtless be covered with grass. The soil on the river is certainly fertile—weeds are occasionally found growing luxuriantly near the bank of the river. Our guide, Mr. Carson, killed a mountain sheep as we were passing the point of a mountain which lay in our route today. This animal resembles the antelope in shape and color, being larger, with the head of the common sheep etc. The weather has been extremely pleasant today. Last night it was quite cold, and this morning at daybreak the thermometer stood at 21°. I have felt sadly homesick today; indeed, I begin to suffer greatly every day from that malady; yet, what long months and how many of them, I have yet to look forward to before I shall return home. 787 miles.

November 20, Friday.—Marched about 17 miles over a dusty, sandy road—dreary and irksome to everybody. Our only satisfaction this evening is in being so much nearer our journey's end. 804 miles.

November 21, Saturday.—We were encamped last night very far from the river—much farther than we had any idea of when we halted—consequence was, great inconvenience was experienced in watering animals, and in obtaining water for culinary purposes. Many of the animals were not watered at all, and in consequence

strayed off during the night in pursuit of water, and were not found this morning—the brush being so very thick they could easily conceal themselves. Started about our usual time this morning, and encamped where we find tolerable grass after a march of only 9 miles. Most of our mules are about on their last legs, and doubtless before 6 days have elapsed our command will be wholly dismounted. The howitzers have broken down most of the mules in the companies, and it is now much to be regretted that they were brought along, but of course we could not foresee they would not be essential to us, having been informed that General Castro had gone into Sonora to issue a large force with which he intended to reconquer California—it was proper for us to retain the means of giving him as bold a front as possible should we fall in with him, but all expectations of meeting him now are discarded. To our great satisfaction and surprise, we learned last evening that our guide, Mr. Carson, had made an error of 2 days in the distance between the Pima village and the mouth of the Gila making this distance just so much too long, so that today we are but one day's march from the mouth of the Gila instead of 3 as we had all along supposed. We arrived at our present camp about 11:00 A.M. today where we shall remain until tomorrow morning. But surrounded by water fowls many of the command are out shooting, and from the frequent reports, we suppose much execution is being done. Made a definite arrangement with Capt. Johnston night before last to exchange companies, by which I shall command B and he D company 1st Dragoons. Satisfactory to me, and I shall have Lieut. Love for my 1st Lieut.—my greatest favorite of all the officers in the regiment. I cannot tell what have been my thoughts today about my cherished home—they have been so rapid and so numerous—but I have pictured a quiet and happy home on our little farm near St. Louis, surrounded by my wife and children. Nothing ostentatious but something marvelously comfortable—chickens, ducks, turkeys, horses, colts, milch cows and calves have played conspicuous parts in my castle building. If the one-tenth part of what my mind has pictured were already real, how much happier should I be than I am

at present. I am too much of a home body, or love my wife and children too much to like this roving, unsettled mode of life. I am sick, I am tired of it. May Almighty God enable me to find relief at the close of this campaigne [*sic*]. This is indeed a beautiful day—not a cloud to be seen, and as balmy as May, save there is not a shade of verdure anywhere visible. 813 miles.

November 22, Sunday.—We started as usual at half past 8 A.M. and rounding the point of a mountain, passed over a very broken route, fell again in the valley of the Gila, and after marching on a plain, uninterrupted except by the thick bushes, mesquite and other thorny shrubbery, some 18 or 20 miles reached a point opposite the junction of the Gila with the Rio Colorado, and encamped finding but little grass for our animals. Before arriving at this point saw tracks of many horses and mules showing that the vicinity had been much frequented of late either as a camping ground *en passant*, or as a temporary resort of a large herd of animals being the starting point in the direction of Sonora, from the waters of the Gila. We were much at a loss to determine in what way the ground had been so much resorted to. Several of us thought it might be the tracks of a large military mounted force which had passed some days previous from Sonora in the direction of California. It was too late in the evening to determine anything satisfactorily with respect to the signs that were visible everywhere, and it was decided to make a thorough reconnaisance tomorrow morning. About night a Mexican made himself known to a sergeant of our camp, but immediately rode off, leaving us as much in the dark as ever. About 8 at night the General determined to send out a reconnoitering party to ascertain what they could, and about this time a fire was discovered to the east of us, some 2½ miles from our camp. Lt. Emory went in charge of the party (20 men) and returned at 11 at night, bringing 4 Mexicans, who reported that they were a party of traders who had in charge some 400 mules and horses which they were taking from California to Sonora—no satisfactory information was obtained tonight, so they are dismissed with orders to

return tomorrow morning when we hope to obtain something more satisfactory from them. One of the 4 is an old grey headed man apparently about 70. 835 miles.

November 23, Monday.—Having learned that there is no grass for 100 miles further on our route, the General has determined to remain here all day to rest animals, and to permit them to fill themselves before starting with such a prospect. The Mexicans came in this morning agreeable to appointment, and one of them becoming quite loquacious and communicative, informed us that the Mexicans about the Pueblo de Los Angeles, had revolted and were in possession of that part of the country—that the Americans were in possession of St. Diego [*sic*] and the seaboard. That Don Jose Mariana Flores commanded the Mexican party, and many other things not important to record, excepting that there had been an engagement in which the Mexicans were victorious over a detachment of sailors, who had approached the Pueblo to attack them.[37] About noon Lt. Emory brought into camp a Mexican who was going express from California. On his person were found letters addressed to various persons in Sonora confirming the information as given above. We are encamped on a sandy slope, and it being very windy today, we are greatly inconvenienced by the drifting sand. Tomorrow, we shall be again en route. May Almighty God prosper us in our journey, and give us grateful hearts, for His goodness to us, at its close.

November 24, Tuesday.—Remained in camp until [blank space] to obtain horses from the Mexicans, got about 25 half broken horses and a few mules, for all of which, a fair compensation in poor mules and money [was paid]. Most of these animals had scarcely ever been bridled before, and there was great trouble in getting them bitted and mounted, but our men succeeded at last, and moved off tolerably well, giving a kick and a jump occasionally, but on the whole got into camp much better than we expected. Of course there was a little lofty tumbling on the route. Started about ½ past 1, and marched about 10 miles. Encamped immediately on

[37] The Battle of the Dominguez Ranch, October 8–9, 1846.

$5.00

The Original Journals of Henry Smith Turner

CAPTAIN HENRY SMITH TURNER, adjutant of the Army of the West, actively participated in the conquest of New Mexico and California with Stephen Watts Kearny in 1846–47. As a professional soldier, he brushed shoulders with many of the great leaders of his day. In a few instances, the acquaintances made during the war, such as with William Tecumseh Sherman, developed into lasting friendships. But Turner's importance in history arises from the graphic journals he kept and the forthright letters he wrote to his wife during his western campaigning.

These letters present a keen and intensely personal reaction to the men and scenes around him. The journal of 1846 which he kept while marching with the Kearny expedition is equally revealing. One moment the entries are strictly factual—the terrain, problems of water and forage, encounters with

(*Continued on back flap*)

the Indians; the next moment the writer is introspective, even moody, longing for his distant home and family. Turner never expected that what he wrote would be read by anyone except his wife, and his comments are frank and unrestrained.

The shorter journal of 1847 was written when General Kearny returned to Fort Leavenworth from Monterey, California. "Now it was the official report of the expedition," writes the editor, "strictly factual and impersonal. It would be hard to find two more sharply contrasted documents written by the same man." Volume 51 in THE AMERICAN EXPLORATION AND TRAVEL SERIES.

The Editor

DWIGHT L. CLARKE is the author of *Stephen Watts Kearny: Soldier of the West* (Norman, 1961). A successful businessman who makes his home in Los Angeles, he has an abiding interest in Western history.

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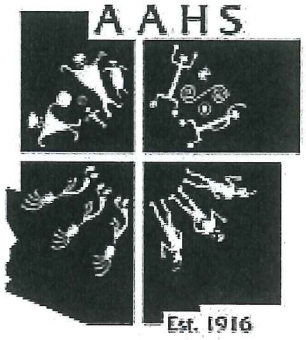

Item #119

EARLY MINING IN ARIZONA

By Eldred D. Wilson

Arizona's history of mining has been impressive. Letting the record speak for itself, Arizona from 1858 through 1945 produced approximately $3,844,000,000 worth of minerals. Of this total value, copper accounted for more than eighty-three per cent, gold about seven per cent, silver five and one-half per cent, lead and zinc two per cent; another two per cent was from molybdenum, tungsten, manganese, quicksilver, vanadium, sand and gravel, stone, lime, clay, asbestos, feldspar, and other nonmetallic minerals.

Arizona has been the leading copper-producing state since 1913, and her total yield of this metal since 1874 has amounted to approximately twenty-one and three fourths billions of pounds. Without going further into statistics, that much copper would make a copper wire, one tenth of an inch in diameter, long enough to reach from here to the sun and halfway back again.

Gold is Arizona's second most valuable mineral product. It was one of the first metals mined in the State, and it was first in annual value of yield until 1878 when silver exceeded it; copper gained the lead in 1881. Now most of our gold comes as a by-product from ores of copper, lead, and zinc; its yield for the year 1943 amounted to more than $6,000,000.

Silver, our third most valuable metal, also was mined at an early date in Arizona. Because of the discovery of Tombstone, the annual value of silver production exceeded that of gold from 1878 until the depression of the nineties. At present our silver comes chiefly as a by-product from base ores. Its yield for 1943 was over $4,000,000.

Some lead was mined in Arizona during the Civil War and earlier, but we have no complete statistics of its production prior to 1894. Zinc production in the State began in 1905. Since 1940 it has exceeded lead in value.

This brief glance at the production record serves to show the importance and magnitude of mining in Arizona. Also it implies a history of first-order efforts and achievements. That history consists of two major parts of which the first, more than 300 years long, involved the pioneering that made possible the second; the second in-

cludes the past eighty-eight years of notable commercial production. The discussion in this paper concerns the first period and part of the second.

Doubtless the most interesting part of Arizona's mining history is the people who made it and how they did it. We can scarcely comprehend their adventures and hardships any more than we can visualize their toil or the number of hammer-blows required to drive miles and miles of mine workings through hard rock with hand steel. Unfortunately, the best part of their history became lost forever as those old-timers passed on. Dr. F. C. Lockwood of the University of Arizona and others have compiled most interesting biographies of a few of the early prospectors and mining people, and these works may be consulted in libraries. The scope of our discussion is limited to a few examples, developments, and trends.

As might be expected, the first people known to have mined in Arizona were the Indians, but they did no extensive mining. Dr. E. W. Haury and other archaeologists have found no proof that they mined for metals, but they occasionally picked up placer gold nug gets. Although these Indians possessed some copper, it was brought in from Mexico. They quarried some stone for tools and implements and used some pipestone. They gouged out pockety deposits of colored minerals, chiefly iron oxide, for paints, and dug clay for pottery. They mined salt near Camp Verde. Apparently their most ambitious mining was for turquoise on Canyon Creek, as described in the literature by Dr. Haury;* the Indians also worked a turquoise deposit at Courtland.

The earliest Spanish explorations through this region were prompted by tales of treasure which proved to be mythical. In 1539 an expedition under a Franciscan Friar, Marcos de Niza, was sent to seek the Seven Cities of Cibola where, it had been reported, buildings were ornamented with turquoise and dishes were made of gold and silver. According to some authorities, this expedition came down the Santa Cruz Valley past the site of Tucson, but others believe that it entered southern Arizona by way of the San Pedro Valley. De Niza

*Haury, E. W., "The Canyon Creek Ruin and the Cliff Dwellings of the Sierra Ancha," Globe, Arizona, Medallion, 1934.

got as far as one of the Hopi villages before turning back. His general route was followed by an expedition of more than 1,600 persons led by Coronado in 1540. Coronado found that the Seven Cities of Cibola had been greatly overrated; he wrote back to headquarters the following summary: "As near as I can judge, it does not appear to me that there is any hope of getting gold or silver, but I trust in God that, if there is any, we shall get our share of it, and it shall not escape us through any lack of diligence in the search." What cruelty entered into such diligence can only be imagined.

During 1583 Antonio de Espejo entered Arizona from the Zuni villages to seek the mineral wealth that Marcos de Niza and Coronado had failed to find. On the upper Verde River, presumably, he collected rich samples of silver ore, but we may only guess as to whether or not he found the famous United Verde outcrop.

During the latter part of the seventeenth century, a Jesuit, Father Eusebio Francisco Kino, made numerous missionary trips through southern Arizona, prepared its first map, and named the Gila and Colorado Rivers. He incidentally prospected for quicksilver without success. In 1705 he wrote that some very good new mining camps of very rich silver ore were being established.

Prospecting for gold and silver in this region was stimulated by the discovery, about 1736, of very rich silver deposits, the Planches de Plata, west of the site of Nogales.

The Indian village of Tucson became a Spanish settlement about 1769.

The Spaniards during this period mined various rich gold and silver deposits in southern Arizona, but authentic accounts of their operations are largely lacking. Elliot's history of Arizona states that they were working gold placers near Quijotoa in 1774.

As determined by Dr. Lockwood, American trappers were numerous on the Gila, Salt, San Pedro, and Verde River systems between 1824 and 1842. Among them were some of the most daring hunters and mountain men in the history of the Southwest: James O. Pattie, Young, Bill Williams, Pauline Weaver, and Kit Carson. These men probably learned about some of Arizona's gold placers, but did not choose to divulge the information until later.

Beginning about 1820, Apache raids caused abandonment of the missions in southern Arizona and discouraged exploration or prospecting. Warfare which continued intermittently for half a century between the Apaches and American settlers began in 1836.

In 1848, after the Mexican War, all of Arizona north of the Gila River became part of the United States, in accordance with the Treaty of Guadalupe-Hidalgo. As a result, the first Boundary Commission began work in 1849, and a protecting army post was established at Ft. Yuma.

During the California gold rush of 1849-50, thousands of emigrants went to California by way of the Gila or along the Camino del Diablo. Unaware of the mineral wealth nearby and in haste to reach California, they did no prospecting.

During the fifties several Government exploration, scientific, and survey parties made maps, investigated possible transportation routes, and gathered information regarding resources of the country.

The Gadsden Purchase, which included that part of Arizona south of the Gila River, was consummated in 1854. The boundary-survey following it was completed in 1855, and American troops replaced the Mexican garrison at Tucson.

From 1853 to 1861 southern Arizona was actively prospected, and many mineral deposits were discovered. Silver mines were worked in the Cerro Colorado and Santa Rita Mountains. Claims were located at Ajo as early as 1854. A small tonnage of rich copper ore from there was hauled by ox-teams to Yuma, whence it was shipped via Guaymas to Swansea, Wales. Freight rates at this time to San Francisco were nine cents per pound.

Discovery of the Gila City gold placers at Dome, east of Yuma, was announced in 1858.

At about the same time the Mowry lead deposit, in Santa Cruz County, was discovered. It was worked during the Civil War, and its owner, Lt. Sylvester Mowry, got into trouble with the Government for allegedly selling lead to the Confederates.

Early in 1858, Lt. Ives, with a small steamboat, the "Explorer," tested the navigability of the Colorado River as far upstream as the Mojave villages.

The early mining activity, although favored by very cheap labor, was greatly hampered by high costs of transportation. In 1857-58, the Butterfield stage line began regular tri-weekly service which did much to facilitate mining in the region.

Travel to Arizona in those days was difficult, and the stages seemed to have been relatively as crowded as the trains and busses are now. R. Pumpelly, a mining engineer, in his book, "My Reminiscences," has described the 16-day trip from Jefferson City, Mo., to Tucson in 1860. His first night's sleep in Tucson was on the floor of a gambling hall; apparently there was a housing shortage, even in those days.

Early in 1861, all U. S. troops were withdrawn for the Civil War, and the country was dominated by Apaches for more than ten years. They killed about 1,000 settlers, and most of the white people remaining fortified themselves in Tucson. During this interval some prospecting was carried on, but little mining was possible in southern Arizona. Prospecting continued, however, along the Colorado River and the central part of Arizona, outside of the Apache domain.

During 1862-3, the discovery of gold placers at La Paz, Rich Hill, and Lynx Creek was announced by expeditions headed by Pauline Weaver and Capt. Joseph Walker. At about the same time, soldiers stationed at Ft. Mohave discovered gold lodes in the Oatman district.

In 1863 Arizona became a Territory separate from New Mexico. Its capital first was at Navajo Springs, but was soon moved to Prescott, where there was gold mining.

The capitol remained at Prescott until late 1867 when it was moved to Tucson for a period of ten years, after which it was brought back to Prescott and remained there until its removal to Phoenix in 1889.

In 1863 lode gold claims were located near Prescott. The Vulture gold mine, the Planet copper mine, and the Castle Dome lead deposits were discovered during that same year.

A better outlet for ore was provided in 1872 when the Colorado Steam Navigation Company established a regular line of carriers between San Francisco and Yuma.

Gold placers were discovered at Greaterville in 1873. Further dis-

coveries of placers and lodes were accelerated during the seventies by an influx of prospectors from the Comstock, from New Mexico, and elsewhere. Beginning with this period, important discoveries and developments ensued. Ore deposits were discovered at Morenci in 1872; Globe and Silver King in 1874; Superior in 1875; Bisbee and Jerome in 1876; Tombstone 1877; Harquahala about 1888; and King of Arizona in 1896.

These discoveries brought a demand for better transportation facilities. The Southern Pacific railway, building from Los Angeles, reached Fort Yuma in 1877, Tucson in 1880, and Lordsburg in 1881. In 1883 the Atlantic and Pacific railway, connecting with the Santa Fe at Albuquerque, was completed across northern Arizona; subsequently this railroad and its land grants became part of the Santa Fe system. From these main lines various branch railroads were built.

Fewer great mineral discoveries were made after the seventies, but, with the advent of railroads, Arizona's mining industry continued to grow in keeping with increased demand for metals. As known ore reserves became depleted, new reserves were added through exploration and by means of technologic developments which reduced costs and provided greater percentages of recovery.

Each individual mining camp has had a noteworthy history. We may outline briefly the beginnings of some of the more important ones, in chronological order of discovery.

Ajo (after James Gilluly): Although the occurrence of copper at Ajo was established at least as early as 1750, it first came to the attention of English-speaking Americans in the days of the California gold rush of 1849. The first locations were made just after the Gadsden Purchase, but the early attempts at exploitation were unsuccessful owing to the low grade of the ore, the difficulty of water supply, and the extremely costly transportation. A renewed attempt to develop the deposits was made in 1894, but it also was unsuccessful.

At the beginning of the present century the brilliant success of the Utah Copper Company at Bingham inspired greater interest in the disseminated copper ores. Considerable promotion but little real development work was done at Ajo.

The active and successful development of the great deposit began in 1911 when the Calumet and Arizona Mining Company, of Bisbee, under the leadership of John C. Greenway and upon advice of Ira B. Joralemon, began to test the property.

Successful exploitation of the deposit hinged upon development of a leaching process to treat the carbonate ores first, and this required an ample water supply, which was obtained.

Clifton-Morenci (Tenney):* A party of prospectors, including the Metcalf brothers, from Silver City, N. M., located copper claims in the vicinity of Clifton and Morenci in 1872. In 1873 the Lezynskys, merchants from Silver City, bought part of the claims and operated as the Longfellow Copper Co. As the nearest railroad point was at La Junta, Colorado, the ores were smelted in a small furnace and the copper hauled by ox-team to Kansas City, 1200 miles distant. Chinese miners were employed, and mining costs were $10.00 per ton. In 1879 a "baby gauge" railway, the first mine railroad in Arizona, was built between the mine and smelter. Transportation costs were greatly reduced by the building of the Southern Pacific railway into Lordsburg, 36 miles away, in 1881, and the construction of a narrow-gauge line from it to Clifton a few years later. Thus the Clifton-Morenci district had its successful beginning.

Globe: Claims were located at Globe in 1874. Although the importance of the copper deposits was apparent, they were not worked until after construction of the Southern Pacific railway across Arizona. In the earlier years of the district, silver deposits in Richmond Basin, north of Globe, were successfully mined. Practically from the beginning, copper mining was successful at Globe.

Silver King and Superior: In 1873 a soldier under General Stoneman was working on a military road across the mountains northeast of Superior. At the foot of the grade he found some heavy, black rock which he afterward showed to certain ranchers near Florence. While prospecting further he disappeared and never returned, but some of the ranchers located his find, the Silver King ore body, in 1875. Discovery of the Magma vein, at Superior, was made soon afterwards.

*J. B. Tenney—unpublished manuscript.

Jerome: Settlers were attracted to Verde Valley after the establishment of Camp Lincoln, near the site of Camp Verde, in 1864. At this time, mineralization in the Verde district was conspicuous but discouragingly remote from transportation facilities.

Lockwood states that the scout, Al Sieber, with George B. Kell, located the first mineral claim here in 1876. Sieber had been shown the outcrop some time before by Tonto Apaches.

In 1876 one of the Verde Valley settlers, M. A. Ruffner, located the Eureka and Wade Hampton claims upon the principal outcropping ore body. His prospecting of these claims indicated a high-grade deposit. As stated by Young, "Ruffner was unable financially to prosecute development of his claims in the manner he wished; he therefore interested two brothers, George and Angus McKinnon, to whom, in exchange for a grub-stake and their personal services, he transferred a two-thirds interest in the property. The three men proceeded to sink a shaft to a depth of 45 feet, which resulted in favorable showings of good ore. Other prospectors were attracted by the developments, and soon much of the ground in the vicinity of the original locations was filed upon.

"The capital of Arizona was then at Prescott, and Hon. F. A. Tritle, then Governor of the Territory, became interested in the district. He enlisted the financial aid of James A. Macdonald and Eugene Jerome of New York (the town of Jerome being named for the latter), and in 1882 the United Verde Copper Company was organized, with Macdonald as president and Jerome as secretary. The property of the new corporation included the Eureka and Wade Hampton claims and a number of the surrounding locations which had been acquired.

"Plans were immediately laid for the construction of a small reduction plant. The Atlantic and Pacific (now the Santa Fe) Railroad had extended its line through Arizona in 1883, and a wagon road was built from Ash Fork, a small station on the railway, to Jerome, covering a distance of about 60 miles, and over which supplies were freighted by mule- and ox-team. Two small water-jacket blast furnaces were set up, and production of matte and bullion was commenced in 1883.

"Even under the great expense involved and the crude methods employed a profit was made during the time the rich copper, gold, and silver bearing oxides near the surface were being extracted and treated. The hopes of the promoters ran high, and financial success seemed assured. Then, as the costs of mining increased and the ores became leaner in values, the profits ceased and losses began to mount."

The plant was closed in 1885, but production was resumed two years later.

In 1884 Governor Tritle appointed Frank N. Murphy as Commissioner from Arizona to the New Orleans Exposition. There Murphy showed Senator W. A. Clark, of Montana, some specimens of the United Verde ore and interested him in the mine. During that same year Dr. James Douglas obtained an option upon the property, but in 1888, after Dr. Douglas allowed his option to lapse, Senator Clark bought control of the United Verde Copper Company for a few hundred thousand dollars.

Following construction of the Prescott and Arizona Central railway connecting Prescott with the Atlantic and Pacific line in 1887, freight was hauled between Granite Siding and Jerome at an average cost of $9.00 per ton. During 1893-94 a narrow-gauge railway, the United Verde and Pacific, was built to connect Jerome with the newly constructed Santa Fe, Prescott, and Phoenix at Jerome Junction.

Beginning with 1894, production from the United Verde mine exceeded 10,000,000 pounds of copper annually.

Bisbee: Copper mineralization was discovered at Bisbee in 1876 by army officers and scouts from Fort Huachuca. In 1879 the Copper Queen Mining Co. was organized to exploit the deposits. In the following year Phelps, Dodge, & Co., through the advice of Dr. James Douglas, purchased adjoining ground. In 1884 the two companies were merged under control of Phelps, Dodge, & Co.

During the late nineties, demand for copper greatly increased owing to growth of the electrical industry. The corporation then built the smelter town of Douglas and the El Paso and Southwestern railway.