# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY


*NCGS Newsletter Editor:*
**Mark Detterman**
**mdetterman@blymyer.com**

*Secretary:*
**Dan Day: danday94@pacbell.net**
***NCGS Voice Mail:* 925-424-3669**


**Website: www.ncgeolsoc.org**
**May 2004 Mt. Diablo Field Trip Photos Added!**
**Future Abstracts Available!**

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**rkirby.geosci@usa.net**

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**John Stockwell**
**kugeln@msn.com**

***Membership:***
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**Barbara.matz@shawgrp.com**

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**Don Lewis: donlewis@comcast.net**

**Frank Picha: afpicha@comcast.net**

**Ray Sullivan**
**sullivan@lucasvalley.net**

## MEETING ANNOUNCEMENT

**DATE:** **Wednesday, September 29, 2004**

**LOCATION:** **Orinda Masonic Center, 9 Altarinda Rd., Orinda**

**TIME:** **6:30 p.m. Social; 7:00 p.m. talk (no dinner) Cost: $5 per regular member; $1 per student member**

**RESERVATIONS:** **Leave your name and phone number at 925-424-3669 or at *danday94@pacbell.net* before the meeting.**

**Speaker:** **Greg Croft, Consultant**

## *Regional Trends in World Oil Production*

For the purpose of identifying regional trends in oil production, the world has been subdivided into six areas. One of these areas, the Former Soviet Union, represents an artificial division but it is a useful one because the countries in this area had similar resource development histories until recently. The five-year historical trends are described below. A discussion of specific areas and plays that will account for future oil production increases will form the conclusion of the presentation.

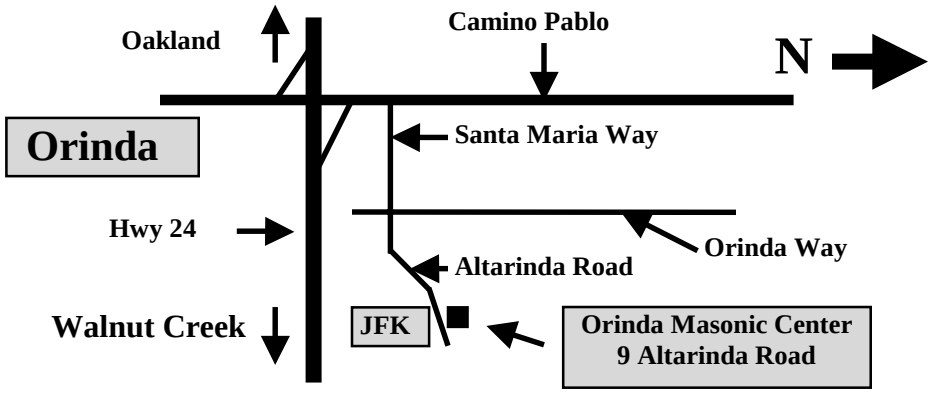
The **Middle East** accounted for 30.4% of World oil production in 2003, down from 31.7% in 1998. Production in Iraq was disrupted by war in 2003, but production in other countries was not affected. The importance of Middle East oil peaked in the mid-seventies, when it reached 39% of World supply. Million-barrel-per-day producers in the Middle East are Saudi Arabia (8.6 million barrels per day in 2003), Iran (3.8 Mb/d), the United Arab Emirates (2.3 Mb/d), Kuwait (2.2 Mb/d) and Iraq (1.3 Mb/d).

The **Western Hemisphere** provided 24.9% of World oil production in 2003, down from 26.8% in 1998. Production in Mexico, Canada and Brazil reached record levels in 2003, but an oil workers' strike disrupted production in Venezuela. Million-barrel-per-day producers in the Western Hemisphere are the United States (5.7 Mb/d), Mexico (3.4 Mb/d), Canada (2.3 Mb/d), Venezuela (2.0 Mb/d) and Brazil (1.5 Mb/d).

Oil production in the **Former Soviet Union** grew to 14.3% of World supply in 2003, up from 10.6% in 1998. Much of this production growth came from Western Siberia, but substantial future growth is expected from Kazakhstan and offshore Sakhalin Island. The million-barrel-per-day producer in this area is Russia (8.2 Mb/d) but Kazakhstan (0.9 Mb/d in 2003) will soon join the club as the Tengiz and Kashagan Fields are fully developed. Oil production in Azerbaijan (0.3 Mb/d in 2003) may exceed one million barrels per day when its offshore Caspian Sea fields are developed.

**Africa** accounted for 11.0% of World oil production in 2003, up from 10.4% in 1998. Numerous deep-water oil discoveries offshore West Africa are continuing to add production capacity. Million-barrel-per-day producers in Africa are Nigeria (2.1 Mb/d), Libya (1.4 Mb/d) and Algeria (1.1 Mb/d). Angola (0.9 Mb/d in 2003) will join the million-barrel-per-day club as deep water discoveries are developed.

## Meeting Location




The **Asia-Pacific Region** accounted for 10.7% of World oil production in 2003, unchanged from 1998. Production increases in China, Vietnam and elsewhere offset a decline in Indonesia. Million-barrel-per-day producers in the Asia-Pacific region are China (3.4 Mb/d) and Indonesia (1.0 Mb/d).

**Europe** provided 8.8% of World oil production in 2003, down from 9.8% in 1998. Most of Europe's oil production comes from the North Sea, where major fields are facing production declines. Million-barrel-per-day producers in Europe are Norway (3.1 Mb/d) and the UK (2.1 Mb/d).

***Greg Croft*** is an independent exploration consultant based in San Leandro, California. He was previously executive vice president, exploration, Harrods Energy Thailand Ltd. and executive vice president, new ventures, Harrods Natural Resources Inc. Prior to joining Harrods, he was a partner in Pantera Petroleum Inc., a consulting firm specializing in Latin America. Before that, Mr. Croft worked for Chevron Overseas Petroleum on projects in Latin America and West Africa. Mr. Croft has been involved in a number of oil and gas discoveries including the Nemba and Lomba fields offshore Angola and the Jasmine Oil Field in the Gulf of Thailand. He holds an MS degree in geophysics from Stanford University and a BA in geology from the University of California.

## *Please Renew Your Membership – A Membership Form is Attached!!*

Northern California Geological Society
c/o Mark Detterman
3197 Cromwell Place
Hayward, CA 94542-1209

***Would you like to receive the NCGS newsletter by e-mail?*** If you are not already doing so, and would like to, please contact **Dan Day** at danday94@pacbell.net to sign up for this service.

# *NCGS 2003-2004 Calendar*

***Wednesday September 29, 2004***
**Greg Croft, Consultant**
***Regional Trends in World Oil Production***
7:00 PM at Orinda Masonic Center

# *Upcoming NCGS Field Trips*

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|---|---|
| **Spring (March) 2005** | ***Colorful Geology of the Fremont Area***<br>**Joyce Blueford and Paul Belasky** |
| **Spring (May) 2005** | ***Robert Sibley Volcanic Regional Preserve in Berkeley Hills***<br>**Stephen Edwards,** Director, Tilden Regional Botanic Garden |

# *Upcoming Field Trips of Interest- Pacific Section, SEPM*

| | |
|---|---|
| **October 8 - 10, 2004** | ***Geology of the San Andreas fault in the Santa Cruz Mountains***<br>SEPM Fall Field Trip<br>**Phil Stoffer,** US Geological Survey |

# *Upcoming Meetings of Interest – Bay Area Geophysical Society*

***September 16, 2004*** BAGS Luncheon:
**Shawn Larsen**, Lawrence Livermore National Laboratory, Seismic Modeling and High Performance Computing

- **Location**: ChevronTexaco 6001 Bollinger Canyon Rd., San Ramon, CA 94583
- **Lunch**: 11:30 a.m., Cafeteria (Building A)
- **Talk**: 12:30 p.m., Rm. D1038
- **Map**: ChevronTexaco Park

Non-ChevronTexaco employees RSVP by email to warren.king@chevrontexaco.com or phone Warren King at 925-842-9964 by 4:00 p.m. Tuesday, September 14th to request a visitors' pass.

No charge for this program. Lunch may be purchased in the ChevronTexaco cafeteria.

If you are coming for lunch, enter through the main gate, pick up your visitor pass from the receptionist in Building A, and meet us in the cafeteria (also in Building A). Look for us at a long table with a white tablecloth on the lower level, to your right after you exit the cashier. After lunch we will walk to the room where the talk will be held.

An abstract and biography is at:
**http://sepwww.stanford.edu/bags/Talks**

## Geologists are amazing*

They know hundreds of words for different sorts of dirt and hundreds of words or things it does when left alone for a few million years.

You Might Be a Geologist if:
1. You own more pieces of quartz than underwear.
2. Your rock collection weighs more than you do.
3. Your rock garden is located inside your house.
4. You can pronounce the word "molybdenite" correctly on the first try.
5. You don't think of "cleavage" the same way everyone else does.
6. You have ever uttered the phrase "have you tried licking it" with no sexual connotations involved.
7. You think the primary function of road cuts is tourist attractions.
8. You find yourself compelled to examine individual rocks in driveway gravel.
9. You're planning on using a pick and shovel while you're on vacation.
10. Your internet home page has pictures of your rocks.
11. You will walk across eight lanes of freeway traffic to see if the outcrop on the other side of the highway is the same type of rock as the side you're parked on.
12. You can point out where Tsumeb is on a world globe.
13. The baggage handlers at the airport know you by name and refuse to help with your luggage.
14. You have ever found yourself trying to explain to airport security that a rock hammer isn't really a weapon.
15. You have ever taken a 16-passenger van over "roads" that were really intended only for cattle.
16. You consider a "recent event" to be anything that has happened in the last hundred thousand years.
17. You have ever had to respond "yes" to the question, "What have you got in here, rocks?"

* Source Unknown

# The Structure and Geology of the Tiburon Peninsula

*Reported by Dan Day*

Speaker **David Bero**, P.G., R.G., NCGS member and exploration/consulting geologist, presented field mapping he has been doing in Marin County at the June 30th NCGS meeting. His talk ***Geology of the Tiburon Peninsula, Marin County, California*** summarized a decade of work he has been doing in his spare time to unravel the complex geology of the Franciscan Formation in this area.

The Franciscan Formation is a ubiquitous and complicated formation composed of deep sea sediments, ocean floor basalts, mafic plutonics, volcaniclastics, and ultramafics representing not only spreading ridge assemblages, but also subduction zone and volcanic arc complexes. The rocks are metamorphosed and often highly deformed or complexly juxtaposed to confound their stratigraphic interpretation. Yet the painstaking field work of geologists like David is gradually piecing together the stratigraphy, structure, and geologic history of this intriguing formation.

The Tiburon Peninsula juts in a NW-SE direction into northern San Francisco Bay off the eastern side of the Marin Peninsula. The famous Ring Mountain high-grade metamorphics border it to the northwest. David's study indicates there are two terrains exposed on the peninsula that are separated by a low angle thrust fault: an overlying ultramafic complex and a footwall assemblage of interbedded sandstone, shale, and graywacke, lesser amounts of conglomerate and chert, and minor greenstone (low grade metamorphosed basalt). The latter is a melange assemblage quite similar to those exposed elsewhere in Northern California. The ultramafics occur as two isolated erosional thrust remnants or klippe, one a roughly circular sheet topping Ring Mountain, and the other forming an elongate folded and faulted sheet exposed along the central and southeast side of the peninsula. The Ring Mountain area is part of a nature preserve and has excellent outcrop exposures. The underlying footwall rocks are unfortunately rather poorly exposed. The footwall assemblage is further obscured by landslides originating in the overlying ultramafics. The base of the ultramafics is a shear zone containing high-grade metamorphic blocks in a serpentine-talc schist matrix. Blueschist grade rocks are prevalent in the southeastern part of the peninsula, and higher grade blocks are exposed at Ring Mountain. In cross section, the elongate klippe of ultramafics capping the southeastern side of the peninsula forms a westward vergent thrust sheet gently folded from east to west into a syncline-anticline pair.

The footwall rocks show distinct textural gradients upward toward the fault contact. Red bed cherts have a bleached appearance, are more thinly bedded, folded, and silicified as one approaches the thrust contact. Near the fault, the cherts become brecciated and highly deformed. David noted that many of the rocks have not been thin sectioned, which would probably reveal even more information about their complex history. The sandstone units are massive and mostly free of shale interbeds. The less common interbedded sandstones and shales suggest a turbidite origin. The occasional conglomerate units form distinctive marker beds. Their cobbles are predominantly grayish cherts and they appear to be associated with deep water sediments. They crop out only on the southeastern tip of the peninsula. Outcrops below the fault are sparse. Where present near the fault contact, the sediments are fine-grained siliceous shales with cherty inclusions.

Geology often depends on good luck, and David was blessed with finding fossils of a large Late Cretaceous foraminifer, *Daphiocyphus*, in a graywacke unit. This provides at least one time marker in the footwall complex. Less commonly seen in footwall exposures are greenstone metabasalts and pillow lavas. The area bears striking similarity to Blake's Yolo Bolly terrain, which has influenced David's structural interpretations.

David illustrated some of the thrust contact relationships with slides of unique outcrop features. One is a linear "tombstone" structure—slabs of ultramafic rock exposed just above the apparent fault contact pointing skyward like a row of spearheads. He suggests that this feature is associated with thrusting action along the fault plane. Textural changes denote the fault's presence, and this phenomenon would appear to conveniently mark the its location across the local topography. Immediately above the serpentine-talc schist with high grade blocks, the ultramafics have a cobbly appearance, perhaps indicating a tectonic breccia.

A distinctive landmark near the rolling grassy knolls of Ring Mountain is Turtle Rock. It is one of several mineralogically "armored" high grade metamorphic blocks protruding through the surrounding serpentine-talc schist. This "knocker" is rimmed with a thin actinolite schist layer surrounding strongly folded and metamorphosed sediments. Many of the blocks are garnet-glaucophane schists. Others are garnet-epidote-amphibolite cut by omphacite (a metamorphic alkali pyroxene)-bearing veinlets. One individual is a glaucophane-lawsonite schist with an actinolite-rich

mantle formed during retrograde metamorphism (metamorphic reactions that occurred as the temperature-pressure regime declined). Another interesting relationship involves lawsonite veinlets cutting glaucophane schist. The blocks are lens-shaped and have their long axes oriented in a NW-SE direction. They occur in a narrow band about 150 feet thick at the base of the ultramafic unit near the low angle fault contact.

To buttress his thoughts on the structural geology of the region, David incrementally sampled a quartzo-feldspathic sandstone layer away from the fault contact and made thin sections. The furthest sample was an angular grained quartz-albite-muscovite-chlorite arkose. Approaching the fault, the rock developed a strong foliation (mineral orientation) parallel to the fault plane, and lawsonite and stilpnomelane mica replaced the muscovite as stable phases. Lawsonite is a high pressure-high temperature phase, fitting for a once active thrust plane mineral assemblage. The high grade metamorphic blocks exposed along the fault plane have been dated at 140 to 160 million years, and are thought to mark the beginning of subduction along this fault plane. There is no age yet for the hanging wall ultramafic rocks.

David Bero will continue to refine his model of the relationship between the ultramafics and the underlying deepwater sediments. Petrographic examination will help him refine his structural model for the emplacement of the ultramafics, and will answer more questions about the evolution of the Franciscan complex in Marin County. David recently began mapping Mount Tamalpais to see if there is structural continuity between the two terrains.

Our sincerest thanks to member David Bero for sharing his research with his fellow NCGS members. David will be leading a field trip to the Tiburon Peninsula September 11th to provide field evidence for key elements of the local structure and geology. We encourage other NCGS members to present any topics they wish to discuss at our monthly meetings. It is an excellent forum for getting constructive feedback from experienced geologic professionals.

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***NCGS Members:*** ***Do you have copies of these documents in your library?? There are currently no known copies of the following NCGS field trip guidebooks. Early last year we published a list of 17 missing guidebooks. Seven of those were found or field trips were confirmed not have used a guidebook. We now have 10 remaining unaccounted for guidebooks. Can you help!!?? Please contact Sandy Figuers at (925) 606-8595 if you have any of these! Thanks for your help!!***

Pampeyan, E.H. and Wollenberg, H.E.; 1969; Mt. Diablo and Livermore Valley; NCGS; May 17, 1969; (no copy known); [Contra Costa, Alameda]; (note: this field trip looked at Mt. Diablo and the creep monitoring of the Greenville Fault, east of Livermore. This guidebook is listed in the Union list of guidebooks under the title "*Camp Parks and Mt. Diablo*", but it was not found in the collection of the listed library.)

Rogers, T.; 1972; Environmental geology of northeastern flank of the Santa Cruz Mountains; NCGS; May 20, 1974; (no copy known); (this was based on a 1971 report done by Rogers for CDMG about this area)

Bowen, O.; 1973; Mother Load Country; NCGS; April 28-29, 1973; (no copy known)

Koenig, J.; 1973; Geysers, Sonoma County; NCGS; September 29, 1973; (no copy known; this may be a reissue of Koenig's 1968 guidebook)

Crebassa, L.; 1974; San Francisco Bay Model; NCGS; January 19, 1974; (no copy known – may not have had a guidebook)

Unknown; 1977; A look at the Franciscan rocks of the Napa Valley; NCGS; June 11, 1977; (no copy known)

Nilsen, T.; 1985; Turbidites along the coast south of San Francisco; NCGS; April 4, 1985; (no copy known); (note: the author did not have a copy)

Chevren, V. and Fischer, P.; 1986; Submarine Canyons – Meganos Canyon and sand, north flank, Mt. Diablo; NCGS; May 18, 1986; (no copy known)

Roberts, B. and Michelson, R.; 1994; Remediation of soil and groundwater; NCGS; March 19, 1994; (no copy known)

Erskine, M. and Howell, D.; 1999; Vallecitos syncline and Coalinga fossil hunt; NCGS; October 2-3, 1999; (no copy known)

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Check Out the Latest at the Website!
www.ncgeolsoc.org

# SEPM FALL 2004 FIELD TRIP:
# Geology of the San Andreas Fault in the Santa Cruz Mountains
## October 8-10, 2004

The Pacific Section, Society for Sedimentary Geology (SEPM) Fall 2004 field trip (Oct. 8-10) will focus on the San Andreas Fault through the Santa Cruz Mountains. Some areas to be visited experienced surface rupture from the 1906 and 1989 earthquakes. The trip is intended to highlight landscape features associated with the active fault system. In addition stops were chosen to examine rocks and terranes typical of both sides of the fault; many of the locations are of highly scenic character associated with a variety of mountain habitats ranging from grasslands, chaparral, oak and evergreen forests, and redwoods. Interested novices and students of geology, and professionals are all urged to sign up for the field trip. Lively discussion and arm waving are expected!

Field guides will be available for registered participants.

**The cost of the field trip registration is:**
$10.00 for students; $22.00 for non-student PS-SEPM members;
$25.00 for non-student non-members.

Participants (campers) may wish to plan to arrive on Friday evening (October 8th), depending on your travel distance, at the Sanborn Park. Expect to arrive by 6:00 pm if possible, otherwise flashlights will be necessary to set up camp (see camping information below).

Sanborn Park is located 1 mile south of the intersection of Highway 9 and Sanborn Road. Sanborn Road is 2.5 miles south of the Highway 9 intersection in downtown Saratoga, CA, and 4.2 miles south of the Saratoga Road exit on Highway 85 in Cupertino (San Jose).

**The Saturday field trip (October 9th: 9am to 5pm)**
The field trip "conference" will officially begin on Saturday morning at9:00 am - participants should plan to gather near the Sanborn Park Campground restroom area (there is ample parking in a lot just below the campground area). The field trip will start with a 2.5-mile moderate hike at Sanborn Park in the morning; picnic lunch will be at the park (bring your own), then afternoon stops will be along Skyline Boulevard (Highway 35) in the Mid Peninsula Open Space Preserve. A final optional stop will be at the Savannah-Chanelle Vineyards wine tasting room (built right on the fault).

**The Sunday field trip (October 10th: 9:00 am to 5:00pm)**
The Sunday field trip will visit geologic and fault-related features in the Sierra Azul Open Space Preserve and park lands around Lexington Reservoir and on Loma Prieta Peak and the surrounding area. The field trip will begin at 9:00 am at the Lexington Reservoir Dam boat dock parking area on Alma Bridge Road (next to the dam) - Alma Bridge road is accessible via Highway 17 North. (Southbound drivers will have to exit at Bear Creek Road and cross the overpass to return south to Alma Bridge Road -- an approximate 25 minute drive from Sanborn Park via Highway 9 through Los Gatos.)

Optional Monday (Columbus Day: October 11th) self-guided field trips will be included in the field guide, including a trip to the San Andreas and Calaveras faults in the Hollister/San Juan Bautista area. Participants can camp at Sanborn Park (limited space has been reserved). Contact Phil Stoffer (pstoffer@usgs.gov) to reserve campsite space. Campsites cost $22 for 2 nights and can hold up to 6 people (2 car parking spaces are available for each walk-in campsite). Reserved sites will be given out on a first come-first serve basis (call Phil Stoffer to reserve a campsite at 650-

329-5028). Van carpooling is recommended. Additional camping and RV space is available through the park reservation system - see http://www.parkhere.org for reservation information and contacts. In addition, inexpensive indoor overnight accommodations are available at the Sanborn American Youth Hostel in the park (phone 408-741-0166).

Participants should be prepared to provide their own meals, particularly breakfast, lunch and snacks. A variety of restaurants and coffee shops are available in downtown Saratoga approximately 3 miles from the Sanborn Park camping area.

Plan on carpooling! Vans are encouraged (no buses). Day use fees of the county parks is $4 per vehicle. Although ample parking is available at most stops, there are no guarantees...

For more information, contact me! Phil (pstoffer@usgs.gov)

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# Registration Form

# Pacific Section SEPM Fall Field Trip 2004

## October 9—10, San Andreas Fault, Santa Cruz Mountains

Please fill out one form **per person**. **Required** registration fee includes field guidebook and basic charge for students and non-students. Camping option are available for an additional price.

Name _____

Address _____

_____

Phone: _____; e-mail _____

Registration fee (**required**):

Member PS-SEPM/non-student: **$22.00** _____

Non-member PS-SEPM/non-student: **$25.00** _____

Student: **$10.00** _____

Campsite at Sanborn Park: 2 nights: **$22.00** _____
[Friday night (10/8) and Saturday night (10/9)]
To register to camp, first contact Phil Stoffer at:
pstoffer@usgs.gov, or call 650-329-5028
Limited space is available.

Total: Make **check** (no cash or credit cards) payable to: PS-SEPM _____

Mail this form and check made out to PS-SEPM **by no later than September 25, 2004**

**Mail to:** John Cooper
Department of Geological Sciences
California State University, Fullerton
Fullerton CA 92834-6850

***Be sure to check PS-SEPM website and /or Newsletter for field trip details.***

# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

# *2004-2005 Renewal Form*

**Please fill out this form and attach your check made out to NCGS.**

**Mail to:**
**Phil Reed**

**NCGS Treasurer**
**488 Chaucer Circle**
**San Ramon, CA 94583-2542**

| | | |
|---|---|---|
| **Dues** | | |
| | **Regular ($15)** | **$_____** |
| | **Student ($ 5)** | **$_____** |
| **Contribution** | | |
| | **Scholarship** | **$_____** |
| | **Teacher Award** | **$_____** |
| **Total** | | **$_____** |

**Please provide the following information:**

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**e-mail:**_____

**I would like to receive the monthly newsletter via:** **E-mail** _____ **Regular mail** _____

**I can help with:**

**Programs**_____ **Field Trips**_____ **Newsletter**_____ **Web Site**_____

**K-12 Programs**_____ **Scholarships**_____ **AAPG Delegate**_____ **Membership**_____

**Please complete the following *only* if there are changes since last year:**

**Address** _____

**City, State, Zip**_____

**Phone: Home (____)**_____**Work (____)**_____**Fax (____)**_____

Employer _____Job Title_____