

boatman's quarterly review

IVO LUCCHITTA

Farewells • LTEMP • Suckers • Bighorn • Escalade • Ron Hayes Photos
GTS • Whitmore Panel • Book Reviews • River Lessons

boatman's quarterly review

...is published more or less quarterly
by and for GRAND CANYON RIVER GUIDES.

GRAND CANYON RIVER GUIDES
is a nonprofit organization dedicated to

*Protecting Grand Canyon
Setting the highest standards for the river profession
Celebrating the unique spirit of the river community
Providing the best possible river experience*

General Meetings are held each Spring and Fall. Our Board of Directors Meetings are generally held the first Wednesday of each month. All innocent bystanders are urged to attend. Call for details.

STAFF

Executive Director	LYNN HAMILTON
Board of Directors	
President	ARIEL ANDERSON
Vice President	KATIE PROCTOR
Treasurer	FRED THEVENIN
Directors	KEVIN GREIF JALYNDA MCKAY BEN REEDER JUSTIN SALAMON EVAN TEA GREG WOODALL
GCRG's AMWG	
Representative	SAM JANSEN
GCRG's TWG	
Representative	JERRY COX
BQR Editors	KATHERINE SPILLMAN MARY WILLIAMS

Our editorial policy, such as it is: provide an open forum. We need articles, poetry, stories, drawings, photos, opinions, suggestions, gripes, comics, etc. Opinions expressed are not necessarily those of Grand Canyon River Guides, Inc.

Written submissions should be less than 1500 words and, if possible, be sent on a CD or emailed to GCRG. Microsoft Word files are best but we can translate most programs. Include postpaid return envelope if you want your disk or submission returned.

Deadlines for submissions are the 1ST of February, May, August and November. Thanks!
Our office location: 515 West Birch, Flagstaff, AZ 86001
Office Hours: 10:30–5:00, Monday through Friday

PHONE	928/773-1075
FAX	928/773-8523
E-MAIL	gcrg@infomagic.net
WEBSITE	www.gcrg.org

Prez Blurb

WELL THE SEASON is in full swing, the water was pretty low this spring. Some interesting things happened. The river is testing our abilities and flexibilities again.

And some things have changed again within the commercial company scene. Arizona Raft Adventures is now running all of Moki Mac's trips under the new name, Grand Canyon Rafting Adventures.

Now, I know this section of the *Boatman's Quarterly Review* has most commonly been utilized as a call to arms for the boating community to stay involved in all the pressing conservation/protection/change of management issues that continue to need our attention and action as an organized group or as individuals. This still is and always will be important. But for this issue I was thinking more along the lines of personal experience.

Back in 2003, I was hired on with High Desert Adventures, I did three Canyon trips swamping, and a bunch of San Juan river trips. Then in the fall I went on an AZRA oar trip as an unpaid assistant. I found out on that trip that the company, guides, and system that I had learned and started getting very attached to and familiar with would no longer be. I wasn't sure if I would be hired by this new company or if I would even fit in. The next spring to my surprise I had some trips. After a training trip and three motors, I decided, for personal reasons, to start over at yet another company—Wilderness River Adventures! New system, new guides, new rules and expectations. Again. I stayed on there and moved up through the ranks, becoming the only female trip leader at the company for some time. But eventually working for a giant corporation started to take it's toll on me and I longed for the small family run business yet again, where I could actually do a river trip with my boss, and have a real conversation, with real people. So, I came back to AZRA after nine seasons away.

I thought it would be easy, and I would remember how everything was supposed to be done, and I hoped that I would be welcomed back. For the most part I was, but some parts proved to be more challenging than I expected. So much so, that for a time I considered going back to the old comfortable and familiar way of doing things on the river. Not all guides have that freedom. Sometimes there is no going back—as I'm sure the guides at Diamond River will attest, having gone through this not too long ago.

The bottom line is that transitioning can be difficult and frustrating—having been on the transition

side a few times myself, and also now on the side of the company welcoming in and orienting new (to us) guides.

For what it's worth, I wanted to say a few things about teamwork, cooperation, and flexibility. They are things we river guides are usually very good at, but sometimes we get a little too caught up in "the way we do things around here" and maybe forget that other systems and ways of doing things have been working just as well for just as long. Sometimes it's nice for those moving over to be able to do a few things in the way that is familiar to them. It is also important to remember that each company, and the guides that came up within that company, take a lot of pride in what and how they do things. Being assimilated into another company won't reduce that pride. And that it shouldn't be confused with arrogance and inflexibility (well, sometimes it is), but for the most part everyone wants to do a good job, and be respected for their

talents, skills and accomplishments that they have worked so hard for over the years. One of the most difficult parts of starting over for me was that I felt I had gotten very good at my job. I was efficient. I knew the warehouse inside and out. I could run a smooth trip and enjoyed training new recruits in the Wilderness way. Then, at the new company, all of a sudden, I felt like a rookie. I felt like I didn't know how to do my job anymore. I had to re-prove myself and my abilities to new peers every trip. It was exhausting and frustrating.

But eventually things smoothed out and I realized that hey, it's just a river trip. And as long as we all try our best, remember to be kind, and don't let dehydration get the best of us. We can all work together and show a boat full of people the time of their lives in one of the most amazing places in the world.

Ariel Anderson

Farewells

PHILIP M. SMITH—MAY 18, 1932 – FEBRUARY 16, 2014

HOW MANY TIMES have we all tossed a rock into the river, reveling in the concentric rings rippling from its source? The dictionary defines the "ripple effect" as: "The repercussions of an event or situation experienced far beyond its immediate location." Phil is that rock dropped into the pool of a diverse life—scientist, polar expert, avid outdoorsman, patron of the arts, all squeezed in to five distinguished decades working in science, technology, and public policy.

When asked to write about Phil for the BQR, the first thing that hit me was the giant ripple effect that he had on every one he encountered. I checked in with lots of Phil's friends to ask them to write a few lines about his impact on their lives, and—as Richard Quartaroli calls it—his "Phil-osophy." The outpouring of stories and tributes I received could take up this entire BQR, so I've tried to just share a sampling to give the flavor of this rich life and its ever-widening ripples.

As for our Belknap family, we have a long list of "if it hadn't been for Phil, we wouldn't have done this or that, or ever met such and such a person, or gone on that particular trip." Our own major life changing events include the Antarctic, the river, and a number of marvelous adventure trips. Our involvement with Phil began with the historic jet boat Grand Canyon uprun, which led to Phil's encouragement of my brother Buzz to work

a season in the Antarctic. Here Buzz happened to meet my future husband, John Evans (already a friend of Phil), and lured him to do a Grand Canyon river trip in May of 1965. John and I were married a couple years later, thanks to Phil's innocent hand in enabling the ripples to intersect. Phil was on the very first Fastwater Expeditions trip when our dad, Bill Belknap, started the company in the early '70s—launching a tradition in which Phil joined us nearly every year until we sold the company in 1986.

In the course of the intervening years, Phil brought a steady stream of friends to join him. Among these was Don Roberts, who recalls, "I had the pleasure of meeting Phil on a river trip in 1974. I was working as a guide for Bill Belknap, and Phil joined one of Bill's first Fastwater trips. Over the next 35 years or so we made many trips together, including trips down the Grand Canyon and many other rivers in the American and Canadian West. Phil had many wonderful attributes, especially those of energy, good humor under duress, and excellent judgment. Phil was always the first up, with fire started/coffee on before anyone else was out of the bag. His energy, his enthusiasm for life and the river and his willingness to mentor and to teach was a great inspiration to me and so many others."

Among Phil's river family was Rob Elliot, and Phil chartered many AZRA trips, filling them with friends, many of whom also became river enthusiasts. As Rob

wrote of Phil: “We honor our friends who pass before us by reflecting on the values we most admired in them and then strengthening those very values in ourselves for our remaining days. When I think of Phil, two values leap to mind. First, set the bar high; if you’re going to do something, there’s no point in doing it halfway. Second, Phil, showed us all how important it is to be a good friend. I will be a better friend, Phil, because of you.”

Gaylord Staveley, who actively worked with Phil on the River Heritage Museum project, remembered Phil’s early contributions to Western River Guides Association (predecessor of GCRG). Art Woodworth, Secretary of WRGA wrote to Gaylord in 1978 : “ We have a WRGA guide in Washington D.C. in fairly high up govt. position, who might make valuable contacts for us in regard to the Grand Canyon draft plan and others. Phil has written this office many times and has sent articles and clippings in regard to river and water problems.”

Phil Smith was a true patron of the arts—mentoring artists, actors, musicians, and writers.

Up until his final days he was still jet-setting to New York and London to catch the latest performances. He was an avid art collector—his Santa Fe home was a repository of masterpieces—of which Bob Rutford, a cohort from the NSF and Antarctic days, commented, “Phil’s home in Santa Fe was the only place I have ever been where almost “priceless” paintings were hung over the toilet!”

Much of the artwork in Phil’s collection comes from the Namingha family and has been recently bequeathed to the Museum of Northern Arizona in Flagstaff where much of it is now on display. As Dan Namingha recently reflected: “Phil Smith has been an important part of my family’s life. He has been a mentor and major supporter. He was always willing to share his knowledge and expertise on numerous subjects and was always enthusiastic about the new direction in my work that of my sons, Arlo and Michael. Phil will continue to be an inspiration to me and my family.”

Actor David Garrison, another of the many introduced to the river by Phil, shared this: “Ralph Waldo Emerson said, ‘The best effect of fine persons is felt after we have left their “presence,” and that, I suppose, more

or less defines ‘The Ripple Effect.’ While Phil Smith has left our ‘presence,’ he has left behind for me countless ‘presents,’ including an enduring example of living life to its fullest (or, as Phil called it, Life in the oncoming lane), a passion for what is possible (in Phil’s lexicon, Optimism is a Management Strategy), and a collection of extraordinary people who I never would have known without his friendship. And, hopefully, I’ve in some small way passed along some of those gifts to others Phil never knew. And they, perhaps, have had an effect on people I’ve never met. The stone, itself, may disappear in the water, but its effects radiate infinitely in time and space.”

My own last river trip with Phil was a Fastwater Expeditions reunion trip in 2010—an outing that came about largely through Phil’s enthusiasm. It included crew and guests from the earliest days of the company—and one new sportyaker: our river history buff, Richard Quartaroli. Here are a few closing words from “Q” about our friend Phil:

“Some twelve years ago, Phil Smith walked into NAU Cline Library Special Collections to donate a copy of the film about the 1960 jet boat trip on the Colorado River through Grand Canyon, which included the only successful uprun. As the river runner in the department,

I became the intermediary, meeting Phil for the first time and luckily becoming a friend and colleague. Phil always believed in sound science for decision making, but he definitely had his passions. Running rivers was one of them, along with documenting that history. He and Buzz Belknap co-presented a piece on the 1960 jet boat trip, titled ‘Audacity, Logistics, and Skill.’ At the 50th anniversary celebration, he added, ‘When you’re young, you’re not inhibited by experience.’ Phil was a strong proponent for a Grand Canyon River Heritage Museum at the South Rim, and we served together on a coalition in support of that dream, one we still have hope for, one to honor those boaters like Phil, who still have those dreams. Good run, Phil, as you head for the great rendezvous on that last rapid—.”

Loie Evans

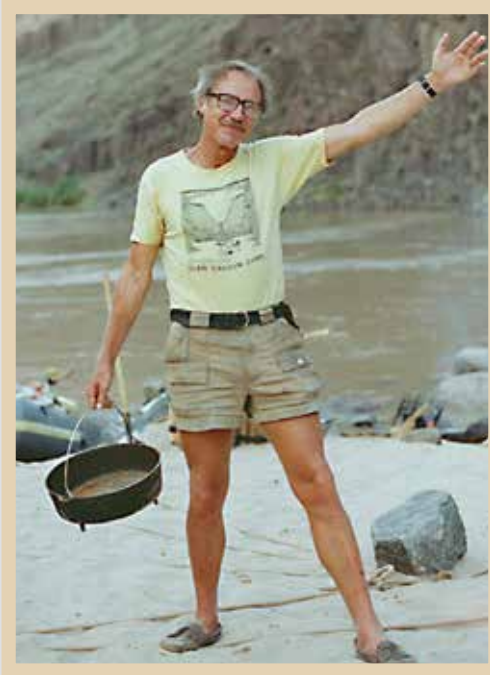


photo: Don Roberts

COLORADO RIVER PIONEER jet boat expedition member Margaret McCourt “Margie” Mannering died March 23RD in a tragic car smash, ironically in the McKenzie Basin of New Zealand where Bill Hamilton pioneered and perfected jet propulsion. She had been returning from Wanaka after completing the book she and grand-daughter Nikki Latham had written about Margie’s husband Guy.

Like the rest of the members of that successful 1960 up-run of the Colorado, Margie was a pioneer and, in a sense, Jet Boating New Zealand has lost their Queen Bee. A comment by recognized Colorado River historian Richard Quartaroli from Flagstaff, Arizona, is poignant and shows the mark she helped leave... “she has run her last river.” However you look at it, we have certainly lost a very special person from our jet boating family.

As the wife of Guy Mannering, the man who almost single handedly showcased Bill Hamilton’s little jet boat to the world, Margie had little choice but to be thrust into what has become the fabric of jet boat history. At a time when women often took a back seat to what was seen as a man’s domain, she and Joyce Hamilton accompanied their husbands on jet boat expeditions into parts of the world most would shy away from. While conquering the Colorado was probably less threatening than their exploits in Southeast Asia, they were still a minority amongst what must have been a sea of testosterone. Like Joyce Hamilton, she handled herself with absolute dignity on that ground-breaking expedition and entered the history books as a role model for women and jet boaters.

My personal dealings with Margie in recent years left me with nothing but admiration. I was asked to invite her to be guest of honor at the Waitaki* 40TH jet boat celebrations, and, in typical Margie understatement, she shrugged it off with “who would want to listen to the comments of an old woman.” Oh, how

she completely underestimated people’s perception of her. She was always so sweet, so gentle, so sincere. Over Christmas, my wife Robyn and I called to say hello and she insisted we have a cup of tea. Anyone who has had the pleasure will be able to picture the scene.

If there is a silver lining in this dark cloud it is that she did see the published book *Guy* that she and granddaughter Nikki Latham had been writing. It hardly seems just, but the release of this biography about a jet boating icon is another important piece of our history puzzle we are fortunate to have. There will be no more ever-smiling Margie and no more “come in, dears, and sit down; would you like a nice cup of tea?” Farewell dear friend, whether you meant to or not, we are grateful for the indelible mark you have left on us all.

Paul Mullan

NOTE: Since 1978, Mullan is a member of Jet Boating New Zealand, and producer of the documentary “The Hamilton Jet Tale,” covering the first fifty years of the jet boat.

He traveled to the Colorado River with Jon and Joyce Hamilton in 2004, meeting with U.S. jet boat expedition member Phil Smith to celebrate their extraordinary achievements.

*Waitaki branch of Jet Boating New Zealand.



Margie Mannering. Photo: Guy Mannering Collection photographs from Joyce Hamilton, *White Water: The Colorado River Jet Boat Expedition (50th Anniversary Edition, 1960–2010, edited by Tony Kean).*

Long Term Experimental and Management Plan for Glen Canyon Dam— The EIS Alternatives Are Out: Say Goodbye to Sand?

H EY GRAND CANYON LOVERS! Have you seen the beaches this Spring? Stone Creek? 118 Mile? Olo? Refreshed. Rebuilt. Amazing! We haven't seen them looking this good for a long time. Last year the Paria River gave us loads of sand, and the November high flow did a great job of putting it up high.

But unless you're ready to do some fighting, don't get used to them.

The future of Grand Canyon flows and floods will soon be chosen from one of six alternatives. They're complex. They're confusingly named. And there's a lot of power rallied behind the ones that take as much as possible

from the Grand Canyon, and do as little as the law will allow to take care of it.

For the latest details, including interesting hydrographs (Hydropower improvement flows?), take a look at http://ltempeis.anl.gov/documents/docs/LTEMP_Alternatives_April_2014.pdf.

I can quickly tell you this: while the public has been waiting quietly for this first glimpse of the possibilities, water and power interests have poured huge resources into setting the stage. They created two of the alternatives—the “Balanced Resource” and the “Resource Targeted Condition-Dependent” (you might be interested in what they mean by “Balanced” and what resources are targeted)—and have been working hard to have one of them selected as the final “preferred alternative.”

A big feature of these two alternatives is restrictions on high flows. Ideas like no more than one high flow every other year, or no Spring HFE's, or even no high flows at all.

A long fight and a huge amount of effort went into creating the high flow protocol, and it's just gotten started. These are the flows that put the sand up where we can use it—sediment that is crucial for the health of multiple resources in Grand Canyon. High flows help keep that rejuvenating sediment in the canyon as long as possible, instead of slowly flushing it all into Lake Mead. They're the best tool we have for moving sand, but they do cut down a little on the water available for generating power revenues.

When the LTEMP draft EIS comes out for public comment, the agencies creating it will have already chosen a “preferred alternative.” It's an important choice that has a lot of influence on the final decision. And that decision will be in effect for twenty years or more. The water and power folks know this—that's why they're so involved behind the scenes.

That's why the LTEMP folks need to hear from you

now, and all summer long. They need to hear from your passengers, and your friends, and everybody who cares about the future of the Grand Canyon. They need to know that we want the preferred alternative to focus on

protecting the canyon and the river, not the revenues extracted from it. We want a healthy environment, built on big beaches, and we want the high flows that create and renew those beaches.

So, sign up on that LTEMP website. Send them your comments. And while you're out there with your toes in the brand new sand, take a moment to talk to your clients about where it came from, what's at stake, and what they can do.

I hope you'll tell them that we want lots of beach building high flows, as many as the Paria and LCR give us the sand for. We want the potential for two floods each year, as intended in the HFE protocols, and we want them to run as high and as long as it takes to make maximum use of the available sand.

The demands of power generation dominated the river for thirty years. High fluctuations and clear water flows stripped sand out of the canyon.

Now it's time to build beaches back up. It's time to take care of the canyon for its own sake. This is our best shot at having beautiful beaches and a healthy riverine ecosystem in years to come, and we need to take that shot. Tell those folks what you care about.

And enjoy the beaches this summer. That Grand Canyon is a glorious place. Thank you for being part of keeping it that way!

Sam Jansen

While the public has been waiting quietly for this first glimpse of the possibilities, water and power interests have poured huge resources into setting the stage.

Suggested Comments, and where to send them:

You can send comments, right now, to: Ltempiswebmaster@anl.gov

You might say things along these lines:

- The preferred alternative should focus on conserving sediment and building beaches.
- Don't restrict HFEs. Run them Spring and Fall, and make maximum use of the sand that's available.
- Focus on protecting the canyon and the river, not the revenues extracted from it.
- The preferred alternatives should not only protect, but *improve* downstream resources.

They need to hear from you, and every comment matters. Thank you for doing your part!



Lower Hot Na Na Beach—February 2012 photo: Greg Woodall



Lower Hot Na Na Beach—December 2013 photo: Greg Woodall

Hot Na Na

Photos of Hot Na Na Beach show the success of the High Flow Events (HFE), however—they also show the importance of management of the flows between the HFE's. Beaches can be rebuilt by high flows, only to be “buzz-sawed” away by daily and monthly flow regimes!

Your comments on the Long Term Experimental Management Plan (LTEMP) will help make sure that HFEs continue to rebuild the beaches in Grand Canyon—and that the in-between flows don't needlessly destroy those beaches!



Lower Hot Na Na Beach photo: Greg Woodall

Razorback Suckers Released in Grand Canyon

ON MARCH 16TH, in cooperation with the Bureau of Reclamation, the Nevada Department of Wildlife, BIO-WEST, Inc., and the Arizona Game and Fish Department, National Park Service (NPS) biologists successfully released nine adult endangered razorback suckers (*Xyrauchen texanus*) in the Colorado River downstream of Lava Falls (River Mile 180).

A native fish found only in the Colorado River



photo: Heather Solee

basin, the razorback sucker was previously believed to have been extirpated from Grand Canyon National Park, but was rediscovered in October 2012 during surveys by the Arizona Game and Fish Department. By tracking the sonic-tagged fish that were released, biologists may be able to detect groups of other spawning razorback suckers, and assess their movements and habitat use.

While the monitoring of razorback sucker has been conducted in Lake Mead National Recreation Area for several years, this is the first time a study such as this has been conducted in Grand Canyon National Park.

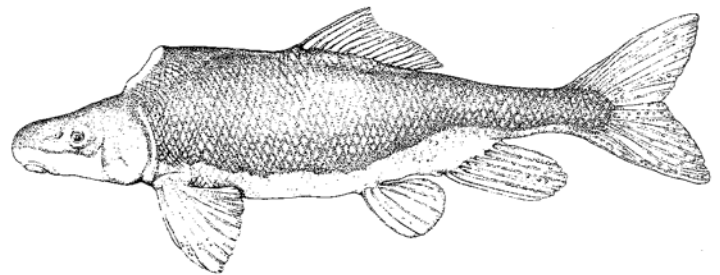
Fisheries biologists will attempt to track the fish during monthly river trips occurring between April and September, by using specialized equipment designed to detect signals emitted from the tagged fish. Grand Canyon National Park Fisheries Biologist Clay Nelson said, "The information that may be gained tracking these adult razorback suckers will be valuable for future conservation and management of the species in Grand Canyon."

Studies conducted during the past three years at the Colorado River inflow area in Lake Mead National Recreation Area suggested that wild razorback suckers are migrating into the Colorado River in lower Grand Canyon. Several fish were tracked upstream as far as Separation Rapid (River Mile 240), and wild un-tagged fish were captured in lower Grand Canyon as part of annual monitoring in 2012 and 2013. These were the first detections of the species in Grand Canyon National Park since the 1990s.

The razorback sucker study is a component of the recently released Comprehensive Fisheries Management Plan for Grand Canyon National Park. Grand Canyon National Park Superintendent David Uberuaga said, "We're extremely excited to release one of the Colorado River's iconic native fish species back into Grand Canyon. It is an important part of our efforts to protect the park's native fish species."

For more information, please contact Brian Healy, Fisheries Program Manager at 928-638-7453. Additional information on humpback chub translocations and Grand Canyon National Park's fisheries program is available online at <http://www.nps.gov/grca/nature-science/fish.htm>.

NOTE: Look for a more in-depth article on the razorback suckers release in the fall issue of the BQR.



Bighorn Respiratory Disease

AT THE RECENT Guides Training Seminar (GTS), Brandon Holton, Wildlife Biologist for the NPS, reported on Respiratory Disease in bighorn sheep and emphasized the importance of reporting sightings of sick or diseased sheep as soon as possible, by *satellite phone* if available!

The Grand Canyon River Runners have updated the Wildlife Census Program Log Sheets to reflect this important note. (See http://www.gcriverrunners.org/pages/Wildlife_Census_Program.htm).

Brandon has requested that *all guides* call him (by SAT phone from the river if possible) at 928-638-7752 if they observe a *sick* or *dead* bighorn, and report its location.

Thank You!!!

Hank Detering



Grand Canyon Escalade Update

MORE THAN TWO YEARS AGO, Scottsdale-based promoters said that May, 2016, would be the grand opening of "Grand Canyon Escalade." They promised that a luxury resort and tramway to the confluence of the Colorado and Little Colorado rivers would bring 3,500 jobs and \$70 million annually to Navajo people. They said that all necessary agreements would be "ready for consideration by the Resources and Development and the Budget and Finance Committees before going to the Navajo Nation Council in May 2013."

Another quarterly session of the Navajo Nation Council ended on April 25, 2014. Legislation in support of Grand Canyon Escalade has not advanced through key committees, as is necessary before being considered by the entire Council. In fact, not a single Council delegate has stepped forward to sponsor such a bill. A

supporting resolution is rumored in the works for the Council's summer session.

While the development is not dead, it has been met with growing opposition by Navajo community members, as well as a unanimous vote by the Hopi Tribal Council to fight it. Families with valid grazing leases in the area pose a formidable barrier to any approval beyond the non-binding Memorandum of Understanding in 2012 between President Shelly and Escalade developers. Shelly is facing stiff competition for re-election in November. No other candidates have endorsed the unpopular Escalade proposal. "Save the Confluence" families greatly appreciate continued support by the river guiding community. For more information, please visit <http://savetheconfluence.com/>.

Renae Yellowhorse and Roger Clark

Photos From The Archives: Ron Hayes

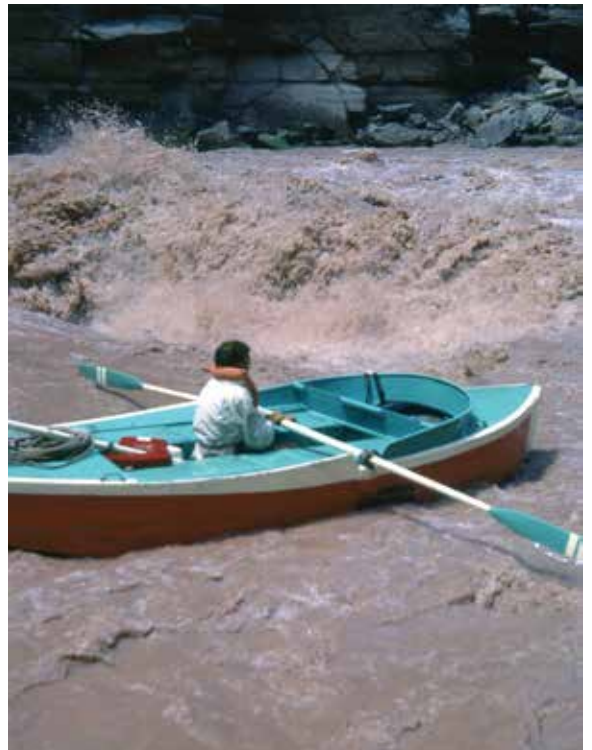
MY SISTER, HEIDI, recently discovered a cache of dad's old slides, and she has been sending them to me.

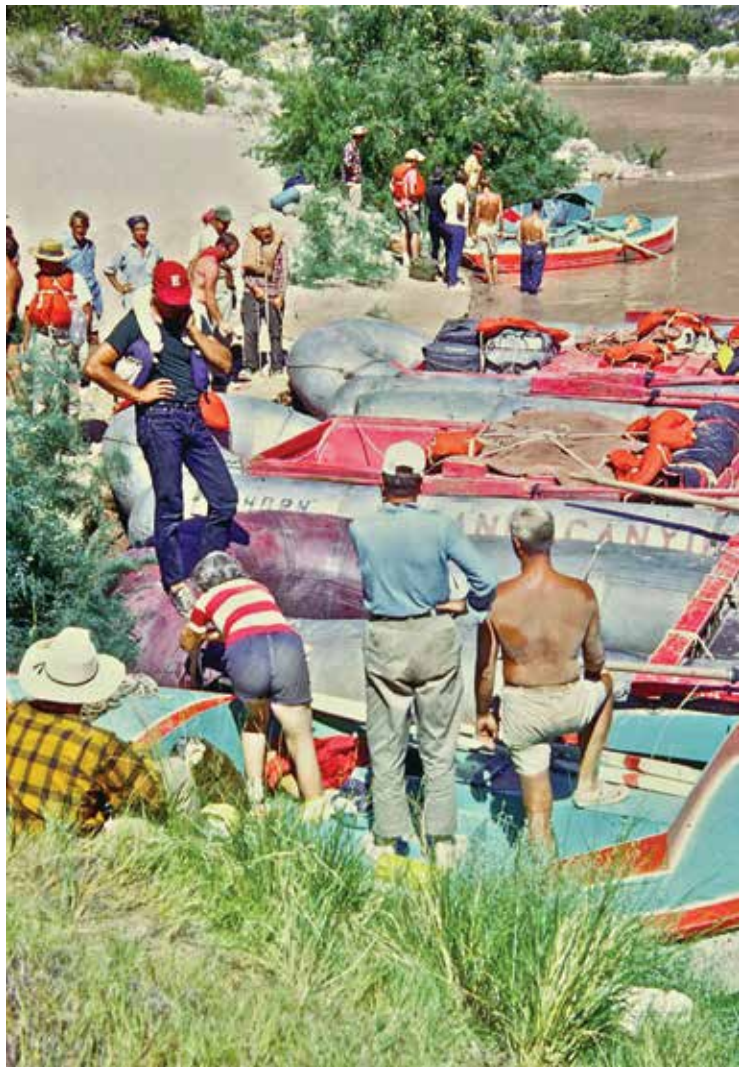
All of the dory images are from a 1967 trip with Martin Litton. Elliot Porter came on the trip to take a series of images that were the content of a large format Sierra Club book titled *Down the Colorado*. Dad rowed the *Portola*, while Martin rowed the *Music Temple*, which did not have its name painted on it yet. Dad took behind the scenes images while Elliot set to work shooting for the book. The sleek compartments in the *Portola* (owned and decked by Martin) were the inspiration for Dad's design of the *Betty Boop*.

Peter Hayes

NOTE: Ron Hayes was an actor, lifelong environmental activist, and one of the principal founders of Earth Day, helping launch the first Earth Day celebration in 1970. Wilderness World (WiWo), began as a joint venture between Ron, and best friend Vladimir and Nada Kovalik in 1970. Wilderness World soon had the contract with the Sierra Club to lead their Grand Canyon and other trips. Ron headed up the Canyon crew through the mid-1970s. Although Ron officially left Wilderness World in 1976 to return to his acting career, he continued to be instrumental in some outstanding Canyon trips.

For more info on Ron Hayes see BQR vol. 17:4, Farewells.





Dory boats and motor rigs, 1967.



Ron Hayes at the WiWo oars.



Martin Litton



Ron rowing a Ten Man UDT raft through Dinosaur National Monument, 1965. Sitting in the rear on her only river trip is his second wife, Betty. She is the namesake for the dory he spent three years building... "Betty Boop."



Ron Hayes flipping a brand new WiWo Havasu in Lava Falls, 1972. The single visible passenger is Ron's youngest daughter, Heidi, who was fifteen at the time. This was the first full season on the Grand Canyon for Wilderness World.



Annual Migration— The 2014 Guides Training Seminar

IN THE EARLY MORNING LIGHT, vehicles rattled down the dusty driveway as people awoke from their tents, stumbling bleary-eyed towards the giant vats of cowboy coffee in front of the rusty-red bay doors of the Hatch River Expeditions warehouse. Let's call it "the annual migration"—two hundred-plus river guides, NPS personnel, and others who share a deep love for Grand Canyon and the Colorado River, all flocking to Marble Canyon, Arizona, once again for the Guides Training Seminar (GTS) weekend, March 29–30. From as far away as Alaska and Maine they came, drawn to this little blip on the map to share the outstanding GTS learning experience and fraternize with their river compadres before the river season started in earnest.

Where learning and community go hand in hand, stewardship and advocacy follow. That has always been Grand Canyon River Guides' philosophy, and no single event epitomizes this more than the GTS. From cultural resources and tribal perspectives to hard science and monitoring, and from human history and thrilling pre-dam adventures to pressing resource management challenges, the weekend covers a lot of diverse ground. Yet it comes together as a cohesive whole through an emphasis on building interpretive knowledge, increasing understanding, and protecting the resources and associated values that this unique Grand Canyon landscape encompasses, not to mention it's just plain fun.

As I gingerly held a live Colorado pikeminnow on Sunday morning for the fish "show and tell" engineered by Grand Canyon Monitoring and Research Center biologists Scott VanderKooi and David Ward, it brought home to me how incredibly special these learning opportunities are and what a lasting impression they can make. As we crouched in a circle, you could see the look of wonder on people's faces and the flash of understanding. We all laughed when the Superintendent was game for having his "gape" measured and compared to a largemouth bass (the Superintendent could open his mouth a bit wider, but not by as much as you would think!). It is special moments like these that I certainly cherish and hope others do too.

First and foremost we would like to thank Steve and Sarah Hatch for giving us a home base surrounded by the magnificent Vermilion Cliffs. Nothing could be more fitting than setting up shop in the Hatchland warehouse with our "river kitchen" and the Whale Foundation Health Fair tents out front, and an array of boats parked nearby. We are so very grateful for the

outstanding speakers who came from far and wide to share their knowledge; the unwavering commitment of park superintendent, Dave Uberuaga, and the innumerable NPS personnel who came to share the entire weekend with us and strengthen our partnership; the very special Native Voices segment that continues to build understanding of tribal traditions and values (with special thanks to Stephanie Jackson for coordinating it); all the cooks, kitchen helpers and volunteers who worked so very hard to make the GTS run smoothly; and last but not least to John Dillon (GCROA) and his rockin' band Buckit for making us put on our dancing shoes. What would a GTS be without an outstanding party! GCRG would also like to extend our deep appreciation to all the commercial river outfitters, the Grand Canyon Fund, and the Grand Canyon Association for their funding support of this event, and to all the individuals and companies who donated items for our highly successful raffle.

And then there is *you*—the GTS attendees. Where would we be without you! I am continually amazed by the river community's endless curiosity, their penetrating insights, knowledge and stewardship ethic, and their willingness to enthusiastically share what they love with others. Together we can build a rock solid foundation of people who care deeply about Grand Canyon and the Colorado River. GCRG is here to help you along that road. Here's to the GTS! Please come and join us again next year.

Lynn Hamilton
EXECUTIVE DIRECTOR, GCRG

GTS photos by Bill Mooz



Guides Training Seminar River Trip 2014

THE GUIDES TRAINING SEMINAR river trip (April 1–15) was coordinated by Grand Canyon River Guides in cooperation with the National Park Service and the commercial river outfitters. Suffice it to say, the trip came together beautifully, the group really bonded, and lots of fun and learning was had by all! Here it is in a nutshell:

GTS FLOTILLA

- 1 CRATE motor-rig
- 1 AZRA dory
- 5 oar boats (2 two from OARS, 1 from OU, 1 from AZRA, 1 NPS)
- 1 kayak

NUMBER OF PARTICIPANTS

- Upper half—17 guides and 13 speakers including NPS personnel
- Lower half—16 guides and 9 speakers including NPS personnel

COMPANIES REPRESENTED (8)

- Colorado River and Trails
- Arizona Raft Adventures
- Grand Canyon Expeditions
- Outdoors Unlimited (OU)
- OARS
- Wilderness River Adventures
- Grand Canyon Whitewater
- Hualapai River Runners

TOPICS COVERED

- Springs and seeps/hydrogeology
- Geology/Lava dams
- Water chemistry
- Biology
- Herpetology
- Astronomy
- Beach change
- River safety
- Public health protocols
- Concessions regulations
- Canyon & river resources
- And pretty much everything under the sun...

SPECIAL THANKS GO TO:

- Our fearless Trip Leader, John Toner, from CRATE!
- The NPS for being such a dedicated partner and to all their personnel who brought so much to the trip
- The owners of Colorado River and Trail and their

staff for all their considerable help

- All the commercial river companies who sent their guides and donated boats
- All the speakers who shared their knowledge and expertise
- AZRA for taking all the boats and coolers up to the GTS
- OARS, Ceiba, and the NPS for their help with the takeout at Diamond Creek
- Hualapai River Runners for sending their guides and waiving the permit fees

GTS VIDEO!

- If you'd like to get a feel for the excitement of the trip, check out the super fun GTS rapids video created by Ryan Christensen of Bristlecone Media. You can access it at: <http://vimeo.com/92412690>

A FEW GREAT QUOTES

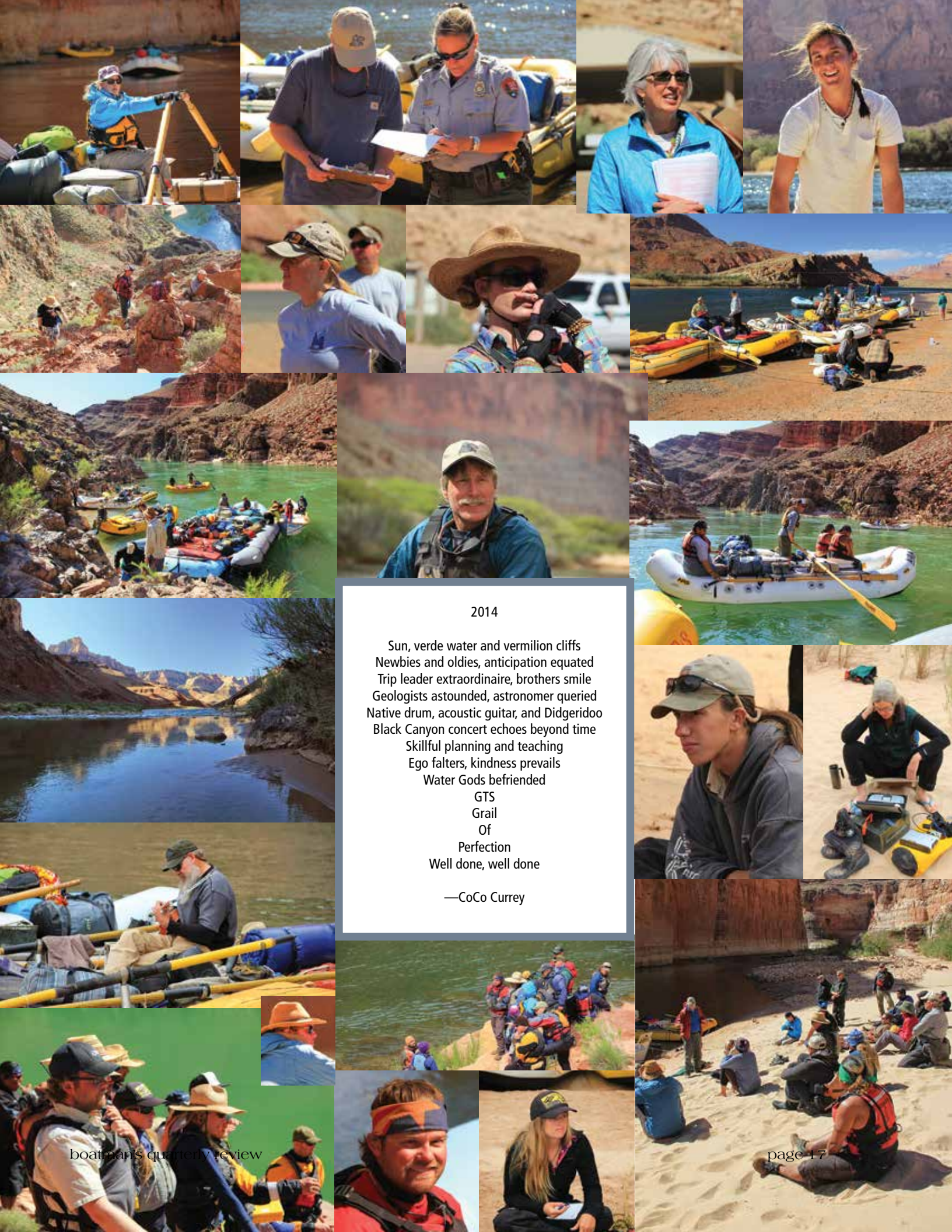
- *“The entire trip was amazing. Toner’s tranquil but controlled attitude really set the stage for the entire trip. In short, the trip was epic! The group of speakers and guides were just fantastic and I would put money down that we could actually survive another week together on the river and still be happy. That is rare. I even got a mini rowing lesson so I fear I have a bug now for wanting to keep learning how to row and read water! I leave the trip not only thankful for the opportunity to talk and show the guides what I and other researchers are doing in the park to protect our resources, but also to learn more about how river guides approach and care for this place. Being able to share and express our mutual love for Grand Canyon was invigorating.”*

—Cynthia Valle, NPS HYDROLOGIST

- *“The GTS was awesome! It really opened my eyes to how much there is to learn about the river and the canyon. I loved hearing about the night sky, landslides, lava dams, lizard push-ups, and springs and their importance for biodiversity. It was also great getting to know so many amazing people from this community. I had so much fun doing moonlit yoga, going on night hiking adventures, and beginning to learn how to row. I wish I could go every year.”*

—Erica Byerley, WILDERNESS RIVER ADVENTURES

GTS Upper-half River Trip photos by Laura Crossey



2014

Sun, verde water and vermillion cliffs
 Newbies and oldies, anticipation equated
 Trip leader extraordinaire, brothers smile
 Geologists astounded, astronomer queried
 Native drum, acoustic guitar, and Didgeridoo
 Black Canyon concert echoes beyond time
 Skillful planning and teaching
 Ego falters, kindness prevails
 Water Gods befriended
 GTS
 Grail
 Of
 Perfection
 Well done, well done

—CoCo Currey

Whitmore Panel Preservation

DUE TO INCREASING concerns about social trail-ing, soil compaction, artifact exposure, and the potential for damage to the pictograph elements at the Whitmore site, NPS staff, working with representatives from the Pueblo of Zuni and support staff from Arizona River Runners, completed a pres-ervation project on April 25, 2014, to mitigate effects from visitation to the site. We obliterated the portion of the old trail that was directly in front of the rock writing panels by adding rock and boulders and plant-ing cactus. We realigned the trail, using a game trail lower down the slope which affords two good viewing locations for the pictographs, while limiting foot traf-fic through the site itself.

To preserve the artifacts that were exposed on the surface of the midden, we added local sterile soils to the midden surface to make a thin covering which matches the current appearance of the feature and to cover the artifacts.

We hope these changes will aid in long-term pres-ervation of the site and hope you will utilize the new trail to access the area.

A full report of the project will be completed in June. We have included a few photographs of the work so you can see some of the changes. Please feel free to contact us if you have any questions. Please share with those who might find this of interest.

The project was made possible through fundraising by the Grand Canyon Association (GCA) and through a generous donation by Joe Orr, who was enthusiastic about the project and for the opportunity to work with members of the Pueblo of Zuni. Without the GCA and the generosity of Joe, this project would not have been completed.

Ellen Brennan
CULTURAL RESOURCE PROGRAM MANAGER



Whitmore pre-work. photo: NPS



Whitmore post-work. photo: NPS



Blacktail

Suze Woolf / suzewoolf-fineart.com

Book Reviews

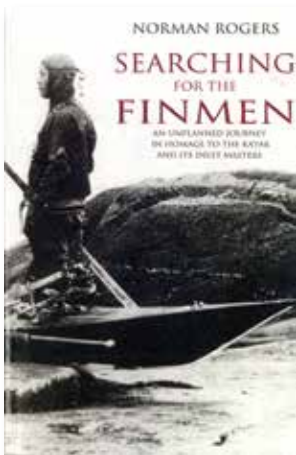
Searching for the Finmen: An Unplanned Journey in Homage to the Kayak and its Inuit Masters, BY NORMAN ROGERS, Matador, 2012, 203 pages, ISBN 978-1-78088-077-8, \$20.

Eastern Arctic Kayaks: History, Design, Technique, BY JOHN D. HEATH AND E. ARIMA, University of Alaska Press, 2004, 161 pages, ISBN 1-889963-26-7, out-of-print: \$15 and up on amazon.

Qajaq: Kayaks of Siberia and Alaska, BY DAVID W. ZIMMERLY, Division of State Museums, Alaska, 1986, 96 pages, out-of-print: \$22 and up on amazon.

IN THE GRAND CANYON it seems obvious that kayaks are a whitewater craft, yet the kayak's whitewater career is a recent development in a history that goes back probably 5,000 years. The kayak is about 100 times older than rubber rafts and whitewater dories.

In 1907, Germany's Thomas Klepper designed a kayak for whitewater, and the sport soon took hold in Europe. Only three decades later kayaks arrived on the Colorado River, paddled by two Frenchmen and one woman, who were filming a nature documentary and trying to prove that kayaks were good boats for wilderness expeditions; Genevieve DeColmont became the first woman to pilot a boat of any kind down the Colorado. They intended to run the Grand Canyon, but winter stopped them at Lees Ferry. Three years later, in 1941, Zee Grant became the first person to kayak the canyon, and in 1960 world champion Walter Kirschbaum became the first kayaker to run every rapid. In 1978 Fletcher Anderson set the kayaking speed record to Diamond Creek—49 hours. The French, Grant, and



Kirschbaum encountered great skepticism, including from Norm Nevills, the NPS, and even the kayak manufacturer, who thought kayaks were too flimsy for the Colorado. Only in the 1980s, with the development of sturdy plastic boats and better whitewater skills, did kayaks become a common sight in the canyon.

Archaeological evidence of Inuit kayaks goes

back about 4,000 years, and carved ivory kayak models may be 2,000 years old. Since kayak components—wood, bone, and seal skins—didn't preserve well, it's likely kayaks were around much earlier, as was the Inuit hunting lifestyle that depended on kayaks. Hunting in dangerous arctic waters required formidable boaters (Greenlanders had about thirty techniques for rolling) and ingenious boat engineering.

The world's most famous kayak is in a museum in Aberdeen, Scotland. It was paddled onto the Scottish coast in the early 1700s by an exhausted Inuit, who couldn't tell his tale because he didn't speak English and died three days later. Ever since, historians and kayakers have debated whether anyone could paddle a kayak across the Atlantic, 1,200 miles from Greenland. As with Grand Canyon's James White story, this mystery has generated many scenarios: he was blown by a storm; he floated on an iceberg; he was kidnapped by whalers and escaped; he was kayaking's Pheidippides, Greek's original marathoner.

British kayaker Norman Rogers had no intention of researching this mystery until one day, training for a kayak race, he found himself inexplicably and repeatedly capsized. Disabled by a balance disorder, he became fascinated by human capabilities and obsessed by the Aberdeen kayaker mystery. In exploring this mystery in *Searching for the Finmen*, he offers lots of kayak history, technology, and lore.

The term "finmen" originated in the Orkney Islands, north of Scotland, where in the late 1600s there was a cluster of sightings of Inuit kayakers, though these reports blurred into folklore about seals that came ashore and turned into men. Still, they bolster the plausibility of the Aberdeen kayaker story.

Well aware of the implausibility of the human feat required, Rogers explores Inuit kayaking abilities. English seamen were impressed that Inuit kayakers, clocked at six to seven miles per hour for long stretches, could outpace twenty English sailors rowing a whale boat. The Danish governors of Greenland relied on kayakers to carry the mail in stretches up to 150 miles. Polar explorer Fridtjof Nansen, who said, "the kayak is, beyond compare, the best one-man craft in existence," sent a kayaker on a journey of 240 miles. Yet the Inuit were hardly invulnerable: in the 71 years between 1782 and 1853, Greenland authorities recorded 415 kayaking deaths, from storms, freezing, overexertion, getting lost in fog, calving icebergs, counterattacks from wounded game animals, and "nangiarneg," dizziness and panic while kayaking, mainly from spatial disorientation.

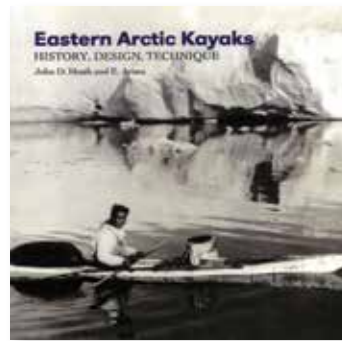
Rogers also explores modern kayaking feats, such as Peter Bray's 2,000-mile, 75-day Atlantic crossing in 2001; yet Bray had a special boat, navigation aids, a desalination device, and plenty of supplies. The Aberdeen kayak was very slender, maybe seven cubic feet in volume, leaving little room for fresh water or food, and the boat had to remain sealed at sea. After a few days the boat was likely waterlogged and leaky. Even with hard paddling all day, the trip required at least two weeks, and the constant attention required to avoid capsizing left little chance for sleep. Rogers devotes a chapter to wave dynamics and kayak hull speeds and surfing, and concludes that if the kayaker got caught in an unexpected storm with huge waves he would be forced to run before the wind and surf the waves, giving him a good speed eastward. Rogers considers various accounts of storm-blown craft and extreme endurance. But, he still has trouble making it add up.

Rogers considers the kidnapping scenario: Europeans did kidnap Inuit for colonial specimens, which included a kayaking demonstration for the Danish king and Barnum-like shows. In the 1700s the Dutch and Danish authorities outlawed kidnapping Greenlanders. Yet there was no obvious reason for a batch of kidnapped Greenlanders to end up in the Orkneys.

Rogers decides that the kayakers came to the Orkneys because of the Little Ice Age of the 1600s, which greatly extended the Greenland ice sheets and brought starvation to Greenlanders, pushing them much further out to sea. From European ships, they knew there were resource-rich lands to the east. But Rogers can't see why one Inuit would have shown up near Aberdeen, far from the Orkneys, perhaps many years after the Orkney sightings, so he is willing to credit the kidnapping escape theory. In the end, he leaves it as another mystery of the seas.

Two books offer far more detailed studies of kayaks: *Eastern Arctic Kayaks* by John D. Heath and E. Arima, and *Qajaq: Kayaks of Siberia and Alaska* by David W. Zimmerly. "Qajaq" is the correct pronunciation, and that's how the Danes spell it, but, as often, the British botched it. The "eastern arctic" means Greenland and eastern Canada. There were different styles of kayaks between the Pacific and Atlantic, but also many similarities. There were about forty types of kayaks overall, defined by varying needs: hunting or local transportation; speed or stability or stealth; team hunting 100-ton whales at sea, solo hunting seals on shore, or hunting caribou crossing rivers or lakes—the river kayaks were designed for speed to charge or escape angry caribou.

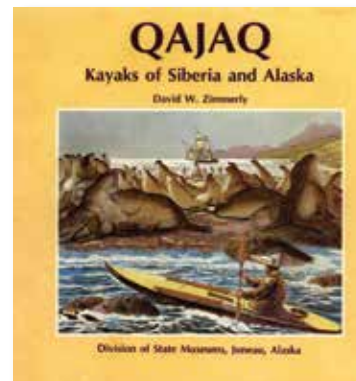
John Heath was the dean of kayak researchers, and he developed a scenario about the Aberdeen kayaker, whose kayak design came from central West Green-



land. The kayaker was blown to sea and took refuge on an ice floe, providing a water supply and some hunting opportunities. The ice got caught in a current that carried it further south than the kayaker realized, so

when he left it and paddled east toward Greenland, he was too far south to hit land, but he was so accustomed to heading east to find land that he just kept going, and the current and wind propelled him to Scotland.

The Heath and Zimmerly books offer architectural drawings and design details of many kayaks, and discussions of kayak types and uses, the construction process, clothing, spray skirts, wooden hats, rolling techniques (with forty photos and drawings in Heath's book), paddles and paddling techniques, hunting gear and strategies, methods for towing a dead whale, warfare, adventure tales, and the cultural importance of kayaks. Building a kayak was accompanied



by ceremonies and sacred songs that brought blessings to the kayak, which was not just an object but a living being. For the Kodiak, the worst insult was "Your father had no kayak!"

The kayak's long history cast a long influence on the design of whitewater kayaks. For 75 years whitewater kayakers were long and sharp-pointed, because, everyone knew, that was the way kayakers were supposed to look. In 1987 I showed up in the Grand Canyon with a kayak that was radically short—only ten feet!—with rounded ends, and everyone thought it a freak. A few years later I hiked Havasu with squirt-boat pioneer Jim Snyder and we talked about the imminent evolution of the kayak. Kayakers were finally breaking free of 5,000 years of ocean navigation and listening to what rivers were telling them, taking shapes that fit whitewater currents and waves. Today my boat still gets odd looks, but now because it's an excessively long anachronism.

Don Lago

The Ghosts of Dandy Crossing, BY KATIE LEE, Dream Garden Press, 2014, 264 pages, ISBN: 978-0-942688-87-0, \$25.00.

NEVER ONE TO REST on her laurels, or anything else, Colorado River and Glen Canyon advocate Katie Lee has written another book, *The Ghosts of Dandy Crossing*, this one a semi-autobiographical novel based on her experiences and journals living at and around Dandy Crossing, Utah, a premier crossing of the Colorado River between Cataract and Glen canyons. Katie found salvation from the night club, radio, and television circuits via the rivers and the canyons of the Southwest beginning in the 1950s, running the Colorado River through the Grand and the Glen with Mexican Hat Expeditions and Jim Rigg, Frank Wright, and Tad Nichols, strumming guitar, penning songs, and singing her way into the hearts and souls of the folks of the canyon country.

Tormented by the flooding of the Glen by that damn dam, Katie vowed never to return until “it” was gone and the Glen reclaimed. But return she has, many times, through her songs, her books, and her interviews, appearing in pretty much any documentary done about what was lost and what could return. I cut my teeth as a commercial Grand Canyon boatman, listening over and over to her *Folk Songs of the Colorado River*. Katie’s previous work about the Glen, *All My Rivers Are Gone: A Journey of Discovery through Glen Canyon*, reissued as *Glen Canyon Betrayed: A Sensuous Elegy*, along with *Sandstone Seduction: Rivers and Lovers, Canyons and Friends*, is based on her journals (she’s one of those fortunate “journalists,” a writer who writes, often and extensively), as she took the advice of friend Edward Abbey, who told her to “...chuck it, and write from your journals.”

The Ghosts of Dandy Crossing is a love story on several levels: the love of Shannan “Shan Lu” Farran (the folksinger-actress) and Buck Watson (the cowboy-riverman), both reluctant to admit it, but perhaps only on their own terms; the love of friends for each other and the locale they share; and the love experienced and lost for the Glen. Shan and Buck “are brought together by their love for a river-canyon paradise—torn apart by the drowning of that river—then held in place by the memory of it flowing through their hearts.” Those who know Katie and her compadres will recognize some river personalities under presumed names. I particu-

larly enjoyed the descriptions of the countryside, the dirt roads, the ramshackle dwellings, and the horrendous storm out on Reservoir Powell, in which Shan meets her “comeuppance,” or does she?, and Buck continues his search for her body, and her heart.

Breaking a bit from tradition, I’d like to include a few other reviewers comments. “*Katie has fought to preserve the ground we live on.*”—Charles Bowden. “*To read Katie Lee is to read great and true history not besotted with the bullshit of academic historians.*”—Tom Russell. “*She is our foul-mouthed, lightning-eyed, boot-stomping balladeer.*”—Craig Childs. “*Katie Lee is a national treasure. The book will break your heart and inspire it also. If you care about American wilderness and those who cherish it, this novel is for you.*”—John Nichols. “*The Dandy Crossing was essential, not only for the first explorers and early settlers, it was also the mid-point for every folktale—true or not—about the river, the surrounding canyons, and the people who lived there.*”—Steve Allen.

One wonders what the next project will be for Katie Lee. At 93 years young, she continues to be an inspiration for us “youngins,” writing, appearing in advocacy films and at film festivals—she has a featured role in *DamNation*, which

will have a showing at the Sedona Public Library on June 10TH. It was only three years ago that she published *The Ballad of Gutless Ditch*, a limited edition, illustrated tale set in Jerome, her home for the past several decades. I am convinced that her passion and her resulting activity and accomplishments are what keeps her going in such fine mettle. I look forward to re-reading *Ghosts*, for I’ve read versions of draft chapters, in fact without the ending until just before the book release. It will be grand to have the continuous, final version to enjoy, the story of the love of two people and their Colorado River through Glen Canyon, the heartbreak from the river’s damming, and the hope of eventual re-creation. *The Ghosts of Dandy Crossing* is another gem from the real jewel of the Colorado River, Katie Lee.

Books may be ordered from: Ken Sanders at Dream Garden Press, also publisher of the anniversary edition of Edward Abbey’s *The Monkey Wrench Gang*: <http://www.dreamgarden.com/>; and Katie Lee’s website, where you can find her other books and music: <http://www.katydoodit.com/>—if you order directly from her, Katie will autograph your copy upon request.

Richard Quartaroli



The Meaning of Rivers: Flow and Reflection in American Literature, by T. S. McMILLIN, University of Iowa Press, 2011, 220 pages, ISBN: 978-1-58729-997-3. \$34.95.

When John Wesley Powell attended Oberlin College in 1858, he was torn between rivers and books. He had started making natural history expeditions down great rivers—the Ohio, the Mississippi, the Illinois—and was enthralled. If Oberlin had offered geology and other natural sciences, Powell might have become more devoted to academia, but Oberlin’s Greek classics and ministry training made him restless and he dropped out, which eventually dropped him into the Colorado River.

Perhaps Powell’s ghost has been hanging out at Oberlin and talking with its English professor T. S. McMILLIN, who has also felt stranded between books and rivers, between academics so stuffed with intellectual abstractions that they can’t connect with real nature, and river lovers unaware of how rivers have flowed deeply in the American literary imagination. McMILLIN wrote *The Meaning of Rivers* to bridge these shores, to explore how literature connects humans with rivers and gives rivers personal and philosophical meanings, far deeper meanings than pop-song metaphors about time and crossing-you-someday dreams.

McMillin devotes one-sixth of the book to the Colorado River, especially Powell and his *Explorations*, which McMILLIN suggests is the best downriver narrative in American literature, Huck Finn included. While historians and crewmates have censured Powell for taking liberties with the facts, McMILLIN evaluates Powell as a storyteller and credits him for weaving a compelling drama. “To read the book as a report runs the risk of seeing it as true or false in its particulars, and that, I think, is to miss the story... But to read the *Explorations* as river literature... is to reopen the book and its revelations.”

Powell creates suspense by using a diary format and using present tense (his original 1875 *Scribner’s* magazine article was past tense) and he milks the drama of the river trip, for example by relocating the George Bradley pants rescue cliffhanger: “The result is that much of the more action-packed drama is grouped together, on the Green River in the earlier stages of the narrative. After [the pants rescue] Powell’s account tends to derive its dramatic tension less from particular moments of excitement than from the increasing desolation of the setting, the dwindling supplies... and ultimately the depth of the party’s encounter with the unknown.” Powell uses the river drama to enhance the canyon’s scientific mystery story. Today we forget that Powell was a geological radical in giving the canyon an

erosional, uniformitarian origin, requiring no divinity or catastrophe, and in the end, after his struggle and misery, Powell used his literary talents to pass moral judgment on this strange, newly discovered natural world, finding it good and beautiful. Powell’s book has some of the epic and philosophical dimensions of a mythological quest story. Perhaps at Oberlin, Powell really was paying attention to *The Odyssey*.

McMillin also takes us down the Colorado River with Edward Abbey and Ann Zwinger, with their different personalities and motivations.

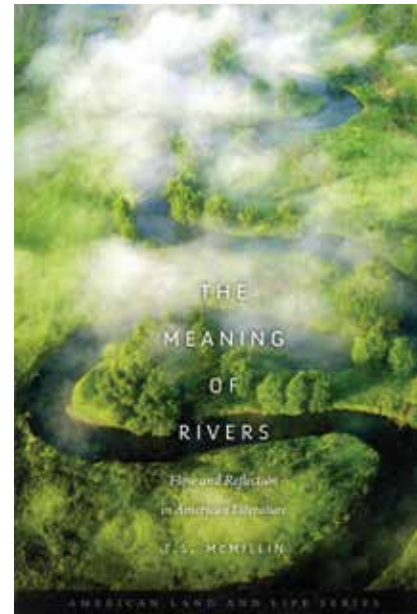
After discussing Powell, McMILLIN examines James Dickey’s novel *Deliverance*, not just an adventure story but a study of the fragile boundary between human wildness and civilization. “Dickey’s deliverance may not differ all that much from Powell’s, in which the exploration of the unknown

concludes not with fixed, firm knowledge but with the never fully knowable Grand Canyon.”

That’s the idea of literary criticism like this, to probe the weave of texts, make comparisons, and find larger patterns, including how literature emerges like a wave from social and historical undercurrents. Thankfully, unlike much literary criticism, a morass of academic lingo and vague generalizations, the power of rivers continually tugs McMILLIN back to the real world.

He examines a wide range of works, some well-known, some obscure: *A Week on the Concord and Merrimack Rivers*, *Uncle Tom’s Cabin*, *A River Runs Through It*, the film *Apocalypse Now*, short stories by Hemingway and Richard Wright, poems by Emerson, Whitman, and Langston Hughes. Every river guide should know Mark Twain’s struggle, in *Life on the Mississippi*, to learn to read the river, his conflict between diagnosing danger and enjoying the river’s romance. For Twain and Powell, reading rivers generated powerful reading for the world.

Don Lago



River Lessons

“kissing takes concentration; however, sex requires titillation by more breath and tongue”

OUR GUIDE, BRADFORD, asked if we wanted the fun mnemonic device or the boring one. We never heard the boring one. My friends, Carrie, Lauren, and I chanted and quizzed each other as we hiked up the steep switchback to the ancient Puebloan granary that was tucked in the overhang of Coconino Sandstone overlooking the long snaking stretch of the Colorado River. Then we named layers that appeared each day, strips of stone that marked our descent into the canyon. *Kissing*—Kaibab, *Takes*—Toroweap, *Concentration*—Coconino Sandstone, *However*—Hermit Shale, *Sex*—Supai Group, *Requires*—Redwall Limestone, *Titillation By*—Temple Butte Formation, *More*—Muav Limestone, *Breath And:*—Bright Angel Shale, *Tongue*—Tapeats Sandstone. Naming each one, I felt a tiny bit closer to the ungraspable time recorded in these layers of stone. Each morning, our guide drew with a stick in the sand, explaining geology we would see that day, continents and oceans moving, colliding, and receding. I tried to picture some of these events, and ended up with disjointed glimpses of the story, images of shallow seawater and piles of tiny shelled sea creatures somehow becoming limestone. Still, as we floated deeper into the canyon, I felt a growing insight. I felt geology, the story of it, our tiny human bodies floating past these layered markers of an ancient story. The scale of things drew me closer to this quirky mix of human animals I floated down river with.

During lunch one day, we gathered with Bradford on a sandbar near the river. Approaching sixty, Brad is boyish, his tan feet at home in worn-out Chacos, and his short sandy blond hair stuck up like a baby bird. Brad avoided getting in the river until one hot afternoon. “I like getting in water about as much as a cat I once had,” he said grudgingly, using a bar of soap to wash his hair and getting back on his dory as quickly as possible. With a willow stick, Brad drew in the sand as he explained the historical evolution of boats in the Grand Canyon. “The first boat was a hollowed-out cottonwood log with a Hopi boy laying in it,” he said, referring to the traditional Hopi story of a boy who traveled down river to the ocean. Then he drew the shape of Powell’s boat in the sand, and the sequence of designs for greater stability and maneuverability that followed. He ended by drawing the shape of a dory, looking affectionately at the dory he built himself, and

explaining that no one had improved on the design for forty years.

All the guides had stories, but Brad spent much of his life on the river, or researching other river people. He emerged as a great storyteller, resembling the quirky, lesser-known characters he admires who were shaped by the river and the canyon as he clearly is. Brad lived his research by building replicas of boats these river people traveled in, and taking his creations down river to learn more about their journeys. One afternoon, we hiked up to an old stranded oar boat, rusting on a rock in the sun. It was the decaying craft of a pioneer boatman, Bert Loper, who died in a Grand Canyon rapid at eighty years old, at the oars of his own boat. Brad wrote a book on Loper’s gritty hard life of mining that took a turn when he discovered “a joy, a thrill, and a peace” in decades of river running in the Southwest. “Not a bad way to go,” Brad said quietly.

“It’s a different world down here, and some people can’t deal with the transition back,” Brad explained while we floated down a quiet stretch of river, steep canyon walls hugging the river. Brad was on the skinny side, as guides go, but he moved with slow ease and confidence earned with decades of river time. Hunching his shoulders, he looked utterly relaxed as he roll-pushed slow oar strokes on the dory, watching the currents, and gazing up to point out wing-shape differences in swallows and swifts. Ease emanated from him, even when his dory climbed fifteen-foot waves of Hermit Rapid.

I wondered about Brad’s transitions between worlds, and I wondered about the other guides. They were clearly in their element here; they knew the geology, birds, plants, history, stories, ruins, sacred places, and most of all, they knew the river. They knew each rapid, where the holes and rocks were, the safest routes, they knew the ways the rapids looked when the river ran with ten times the water level. They were strong and competent and generous. They worked unbelievably hard, laughing and teasing as they worked. I wondered how they carried this river knowledge with them as they went through the rest of their lives. I felt so clearly the way they were carried by the power of this place, and I wondered if they felt its power, missed its power, when they walked down the street in Flagstaff.

The last morning on the river, I asked Brad questions about boatman culture in the Grand Canyon and about how his deep knowing of this place and the

vast earth time it maps has affected him. I sat on the front deck of the dory. The green milky water swirled and eddied silently as we drifted toward the next small rapid. I watched a turkey vulture sweep along the Red-wall Limestone wall, its shadow a perfect match flying just below and behind. The vulture glided away from its twin on the rock as it caught an updraft, then slid back to almost touch its reflection. Bright red blossoms on the thin upright ocotillo branches caught the morning sun like flames. Barrel cactus, scattered across the slope, poked up their round heads and looked like bald little people watching us float past.

“A lot of Native cultures lived around this place or had sacred places in the canyon, but boatmen are the first and only culture to know the place from the perspective of the whole river,” Brad explained as he slowly pushed the oars. He lowered his voice, speaking as much to the canyon as to me. “Boatmen are reverent about this place—its power and its beauty. It’s almost a form of animism. If you need god, this is it: the canyon, the river, the way they interact. This place has done wonderful things to an awful lot of people down here.” He paused, and a canyon wren broke the silence with its watery descending call. Brad continued: “When we started in the ’70s, there was a lot of egos and a lot of chest pounding, but you come to view the river not as an adversary, but more like a mother or a lover or a part of you.”

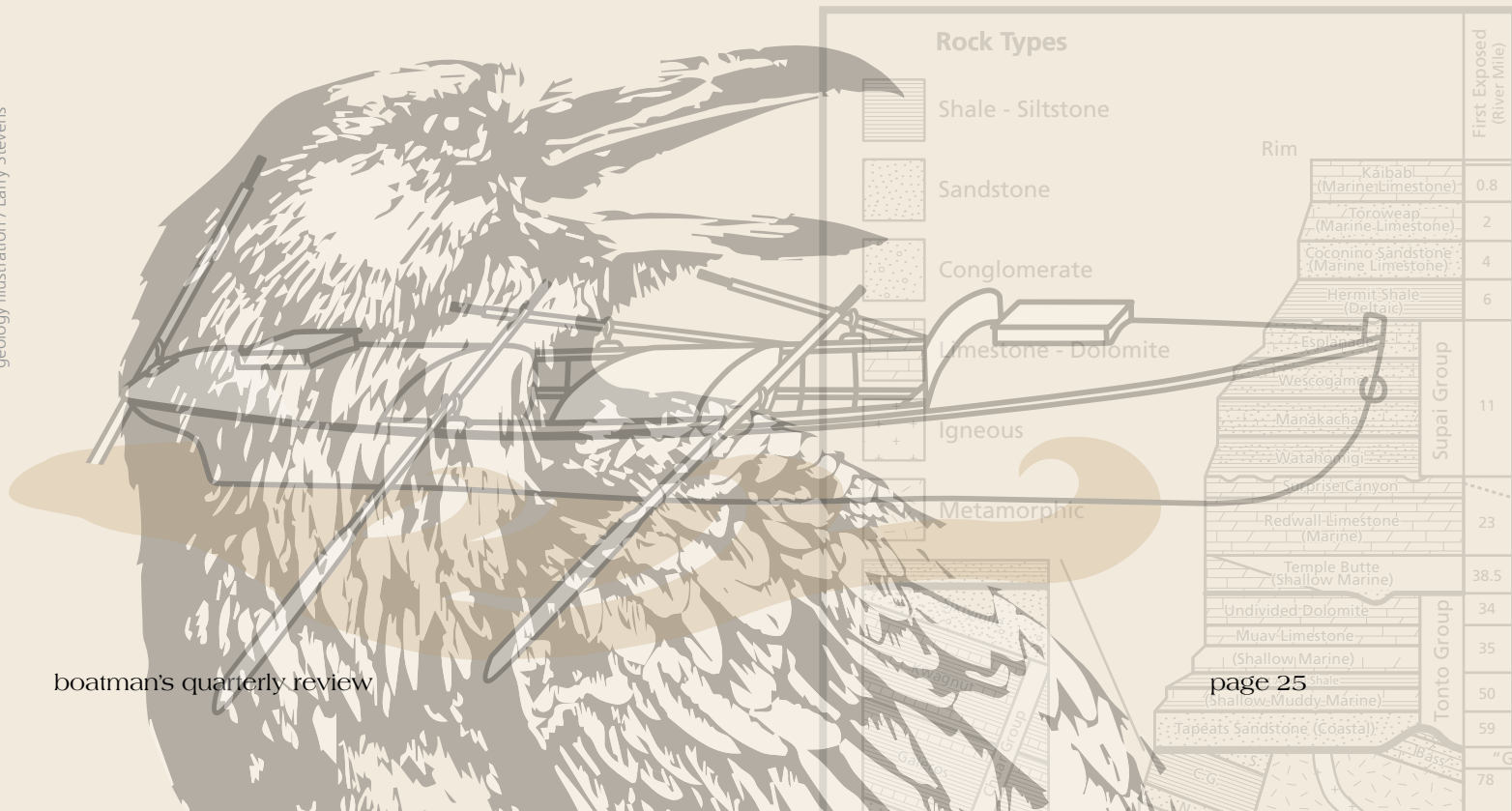
“There are a lot of usage battles as the world gets crowded,” Brad said. It was day fifteen, and we were floating our last two hours back towards the crowded world. “Native Americans have a spiritual connection to the land,” he said, “but some have plans to desecrate it.” Brad was referring to the Navajo’s controversial de-

velopment proposal that would include hotels, stores, and a tram built down into protected Marble Canyon. The proposal unveils controversies in boundary lines and complexities of land-use decisions in the canyon. The Hopi tribal council opposes the development, and Hopi oral tradition tells of the tribe’s emergence at Sipapu, a springs near the river confluence. A young Navajo woman who works as a river guide has been active in her community, trying to gather support to oppose the development. Should the boatman have a say in what happens to this canyon? Brad thinks so. “Someone asked me about what cultural sacred places there are here for boatmen culture,” he said, “the whole thing—every swirling eddy and side canyon.”

For the next two hours, we traveled the river in silence. The rock walls became more crumbled and less distinct as the canyon opens up, piles of black tubular volcanic rock and sculpted schist along the shore. The river swirled and boiled, its power surging even in the slow sections. It was a relief to be quiet and let the canyon speak for itself. We finally reached the pull-out, and a crowd of people and gear and vans gathered along the shore. The buzz and sadness in the return were palpable as our boat scraped against the pebbled shore. Practiced by this point, our group formed a line, passing each other coolers, boxes of cooking equipment, metal “groovers” with two weeks of shit—everything that made our last two weeks on the river possible. Our guide got an amused twinkle in his eye as we took off our life jackets. “Back to being land creatures. We should be issuing helmets.”

Anne Haven McDonnell

geology illustration / Larry Stevens



IVO LUCCHITTA

WHEN I WAS AT CALTECH [California Institute of Technology]...I was a physicist, I loved physics. You had to take courses, very wisely, in all kinds of other sciences—astronomy, for example. Fred Hoyle was teaching that. Caltech was an amazing place; chemistry, Linus Pauling—amazing people. In geology, which I had to take, the teacher happened to be a professor called Bob Sharp, R. P. Sharp, who did quite a bit of work in the Grand Canyon. That guy was *such* a good lecturer, and he made the world out there come alive so amazingly well, that we would go on field trips and I had this funny feeling that the world was talking to me—nature out there, the rocks, the mountains, the rivers—and I said, “Yup, that’s it! That’s what *I’m* going to be doing!” That was the conjunction of two things: geology was an interesting science, and my love for the outdoors, which came from my Dolomites Alps experience as a boy.

I got my degree [B.S. in geology] eventually—took me five years [1961]—and there was a professor there by the name of Richard H. Jahns, who was a real human being. Bob Sharp was; Jahns was. Jahns was going to go to Penn State, which at that time was an *excellent* earth science university, to be the dean of the school of mineral industries. He said, “Come along with me. Hey, that’s not a bad place to go.” I didn’t know anything about Penn State, but it was a *very* good thing to go there because I was a very good technician, I could solve problems. What I never had learned was what the problem is in the first place. At Penn State I learned that. They taught us to think, not just to solve equations, but to think and say, “Okay, what is the problem?” There was a not-crazy-at-all, but very strange and heavily-accented professor who was of Russian origin, Paul Krynine. “Okay, boys, what is the problem?”

I think it was the first fall that I was there, the geology department was in the oldest building on campus—stone floors, very noisy. It was disturbingly warm and the doors were open, the windows were open, to get a little bit of draft. Routinely, ten minutes after the class started, there would be this infernal clickety-clackety noise coming down the hall, and in would sweep this lady, dressed European style with a skirt and high-heeled sandal-type shoes. Quite noticeable—everybody noticed. Everything stopped—my future wife, who then, as now, has never been on time in her life for anything. She was a beginning graduate student, just as I was. We’re both European background—we sort of spent time together, and

eventually got pretty serious. Most people would go for a master’s first, and she did. I, being I don’t know what—stupid—said, “Why waste time with that? If I’m aiming for a Ph.D., let’s do that”—which is dangerous, because if you, for some reason, didn’t make it, then you had nothing. Her name is Barbara, but it’s the German diminutive, B-A-E-R-B-E-L. I can’t pronounce it properly—not after all these years even. She had to take a field geology course out there in southwest Montana, Dillon, near the continental divide—we drove out together. I had a vw bug. She stayed and I left and drove solo, nonstop, to L.A.—these things I wouldn’t dream of doing now. I still had roots in L.A., but the reason for all of this was—this was ’62—the reason was that I actually had a job as a summer assistant to Bill Breed here at the Museum of Northern Arizona. I got that because while I was in L.A., I knew a couple, who were very good friends, by the name of Jeff and Eileen Lunge—Eileen was the sister of Ned Danson’s wife, Ned Danson being the director of the museum at the time—these folks knew me, and they knew that I liked mountains. They said, “Why don’t you apply for a job there? We know you’ll like it.” There I was, the assistant to Bill Breed, which was fun, was very interesting. Later on, my future wife came out from Pennsylvania for a visit.



Ivo and Baerbel enjoying a day in Sedona.

During that summer, there was something cooking at the museum—motivated by a famous geologist by the name of Eddie McKee, who can be considered the father of Grand Canyon geology—really, truly. He was an associate of the museum—he'd been at the museum for a while, and was interested in trying to shed some light on this old, old problem of the history of the Colorado River and Grand Canyon. The focus was really more on the Grand Canyon, but you couldn't avoid the Colorado River, because the river made the canyon. He and Stan Beus—a prof of geology at NAU—Bill Breed, and Dick Wilson. Dick Wilson was a geologist and an old-time resident of this area. Those people thought we really have to study the Grand Canyon situation. They decided to have a symposium in 1964 at the museum, to which would come essentially everybody that had ever worked on the problem of the Grand Canyon—somewhere between twenty and 25 people—of which two were graduate students whom Eddie McKee wanted to go and smoke out two problem areas: one being Peach Springs Canyon near the town of Peach Springs; the other one being the mouth of the Grand Canyon. The Peach Springs Canyon thing went to somebody who then became a friend, Richard A. Young. That was important, because one of the theories had been that the old river went out through Peach Springs Canyon, and then off to the southwest somewhere. But there were some gravels in there that tell you which way the river *really* flowed. Dick was able to show there was no question that there was no southwest flow by the Colorado, it was some other river coming *from* the southwest.

The other important place was the *mouth* of the Grand Canyon, because there were all kinds of deposits there that tell the story. A fellow by the name of Chester Longwell, way back in 1935-'36, had looked at that in a reconnaissance kind of fashion and said, "You know, these are what we call interior basin deposits, the kind you would find in the basins of Nevada, where there is no through-flowing drainage at all, it's all captured by the basin." He thought that those deposits were of that kind. But that needed to be smoked out a little bit better, studied in detail, and that ended up being my job. I started in the fall, November of 1963. It was so terrifying. In those days that was totally empty, deserted country. There was nobody around at all. Have you heard of Meadview, have you been there? There was nothing there. The road to Sandy Cove was not there. There was just a road to Pearce Ferry. And Pearce Ferry was high and dry. Why? Because Lake Mead level was really low. Why? Because they were filling Lake Powell. Glen Canyon Dam had just been finished, and they were filling Lake Powell, and they

were releasing almost nothing down into Lake Mead. That is the time when Bill Belknap, for example, did his famous run, where he was looking at the bottom of Hance Rapid and things like that, because there was no water. He did it in the Sportyaks, if you can imagine.

The problem was, if I were to try to get to the mouth of the Grand Canyon, which I needed to do, because it was part of my field area, there was no water. If there had been water, I could have figured out, you know—in fact, I borrowed a Sportyak from Bill Belknap to do the work in Iceberg Canyon and that country. But in the upper part, it was mud flats. You couldn't *walk* in those. You were forced to go on land, and there was a *real* expedition to get to the mouth of the canyon. It was hard. It was *not* beneficial. But it was beautiful because there were no people. The coyotes were singing at night, and there was some residual sort of pools. They were not very big, but they were paradise for water birds. From the point of view of wildlife, it was a great place—from the point of doing geology, not so good.

I think it was around that time, the winter of '63, that we were visited—my wife would come out periodically, but I always had another assistant—by the ranger at Lake Mead National Recreation Area, a ranger at Temple Bar. We became fast friends and he introduced me to all kinds of people. I think I got to meet Bill Belknap through this guy, Allen Hagood—he was a ranger at Zion, and then at Dinosaur, and then eventually ended up in Denver at the home office for the Western Region. I think it was either through Allen Hagood or through Bill Belknap that I did my very first boat trip in the Grand Canyon, probably in '63, or winter '62-'63. There was a guy from the Fish and Game who needed to go up, and actually, come to think of it, by that time the water level had risen, so it might have been '64. We went up quite a long ways in the canyon, and that boat had the ability to deal with relatively minor rapids, up above the slack water. It took so long that I remember coming back at night. In those days Lake Mead was full of log jams, because all the big snags had been coming down—there was no Glen Canyon Dam previously—and all the logs were still there in upper Lake Mead, and you couldn't go very fast. For example, the mouth of Grand Wash Bay was completely blocked by a log jam. That was the trip when there were some other people along, and I believe one of them was Dock Marston. I didn't know Dock Marston. What did I know? Just another guy sitting in the boat, but I believe that Bill Belknap or somebody later told me that Dock Marston was on that trip. It was interesting, you know, for somebody who didn't know beans about anything.

QUARTAROLI: What about the Belknaps? Can you relate how you met the Belknaps and what you were doing with that Sportyak with a motor on it?

LUCCHITTA: Allen Hagood, who was the ranger at Temple Bar. Of course he knew the chief park naturalist—Ted Whitmoyer was the name. We got together and they were very helpful in those days. The park was *really* very helpful. I said, “I’m studying the geology, and I’ll give you copies of everything.” Ted Whitmoyer had a camera shop, a photo shop, in Boulder City, not far away from where the Belknaps had their house. I suspect that’s how I met Bill and Fran. Bill was *very* interested in anything to do with the Grand Canyon—always was like a sponge. We talked, I think he came and visited in the field a couple of times.

Then one time—I don’t know how it happened—but I’m sure we were talking about the fact that we had to go and map the stuff on the northern end of Gregg’s Basin and Iceberg Canyon. You really couldn’t get there by land. I wasn’t sure I knew how I was going to do it. Bill said, “Oh, not a problem.” That’s when he trotted out his little Sportyak with its one-and-a-half-horsepower British Seagull. That was really something, because forward motion was minimal, but it did happen, we did manage to get where we needed to go. That was kind of fun. We used to visit Bill quite a bit because out in the field, of course, no shower, no nothing. I had to go and map north of the river, too, up in the Grand Wash country, that was a long trek. You had to go from Meadview all the way, Las Vegas, and then around, Mesquite. Whenever we had to do that, we would stop by and visit with the Belknaps. They would graciously provide us with a shower.

* * *

Ivo Lucchitta’s voyage to the Grand Canyon took 25 years and encompassed many countries in a zigzag fashion: Czechoslovakia, Austria, Italy, England, with some of them more than once; I may have missed some countries and that certainly is not all the zigs or the zags. Of Russian, Bohemian Czech, Italian, and maybe Austrian heritage, along the way he learned seven languages and studied in several countries. The focus of this interview is, of course, Ivo’s work in, and relationship to, the Grand Canyon and the Colorado River and Plateau—from defining research at the mouth of the Grand Canyon, to work with the Apollo program at the USGS Astrogeology branch in Flagstaff, to mapping in and around the Grand Canyon, to research on the Colorado River. But Ivo’s family life, travels and travails, prior to that are such a wonderful story that they have to be included. Particularly noteworthy are Ivo’s mom, Mara, adamant

that Ivo be Czech, and her favorite cousin, Ivo’s namesake, Uncle Ivo, and his continuous struggle for freedom. You’ll notice that I don’t appear very often, with an occasional prompt or question. I edited myself out whenever possible, but the fact is that I wasn’t in the interview much anyway—as those of you who know Ivo, he is a great storyteller and needs little prompting.

—RICHARD QUARTAROLI

* * *

LUCCHITTA: Well, Richard, my story is quite an unusual one—probably not so much for Europeans who were born in a time of troubles—World War II, when all sorts of bad things were happening—but I think for most Americans who’ve had a relatively simplified life in comparison to mine.

On my maternal side, my grandfather, Vasja, was a Russian of the old regime, was in the diplomatic service, and was living in Rome with my grandmother. He had an amazing art collection. It was while he was there that the Russian Revolution happened in 1917. He basically lost everything, but being typical of a certain type of a person, he told the Italian state, “Well, this stuff really belongs to you”—he *gave* it to the Italian state.

My grandmother, Ruzena, was Czech, and she came from a well-off family that owned factories and things of that nature. It was obvious to me that as a young girl, a teenager, she was already interested in art. But this young woman was not keen on sitting out in the country, or in a small city. She always had the itch to get out of there somehow and into the big world. The first opportunity came with a German officer. She got engaged to him, and that caused an immense uproar in the whole country because the Czechs have never been too fond of the Germans. No way, it could not happen. Then my grandfather, at some point was in Prague, and they met, married, and moved to Rome, where she practiced her art.

They had one child, my mother, Mara, who went and lived with her grandparents in Bohemia. At some point, I think it was either ’35 or ’36, Mara decided—this is incomprehensible to me—she decided she was going to drive entirely around the Mediterranean Sea in her little sports car. Think about that—through the Sinai Desert, for example. Either before she started or during that trip, she met my father, Bruno Lucchitta, who was a person from northeastern Italy, the corner that kind of interfaces with Austria and Slovenia, not far from the town of Udine, that, I believe, was still Austrian until the end of World War I. He was born an Austrian citizen, I believe. It’s a part of Italy where

you might as well be in Germany, as far as what people look like and how they behave. It's a region called the Friuli. My father was an aeronautical engineer, and they did either all or part of this trip together, and eventually they got married, and I was a product of this, the only one. My mother clearly wanted me to be born in Czechoslovakia, in Bohemia, in a town called Budweis [pronounced Budweis], where the *real* Budweiser beer comes from. I'm very proud of the fact I was born in 1937 in a clinic on a street that is called U Trí Lvu, which means "at the three lions." I think that's a nice romantic place to be born!

They went and lived on Lido, which is the island offshore from Venice, a resort island, because my father managed the airport. The next step was that he managed the airport in a place called Wadi Halfa, in what was then the Anglo-Egyptian Sudan, along the Nile, I believe at the Sixth Cataract. That was the *Anglo-Egyptian Sudan* then, a British colony. When Italy declared war on Britain and France, my father was an enemy alien, and he had to be interned—by his buddies, his British colleagues—in some obscure spot in the Sahara Desert and he sort of disappeared for six or seven or eight years. Nobody knew whether he was alive or dead.

My mother and I, however, were allowed to leave. We ended back in Czechoslovakia. We were there for a while—a happy time. Except that in 1939, Hitler occupied Czechoslovakia, and this was not good, because the Nazis wanted as much as they could get their hands on, including all these factories that my family owned. My mother noticed that members of the family were disappearing. Two years ago I learned that some of them ended up in Auschwitz and places like that. A lot of Americans think that those places were only for Jews—not so! The Nazis did not have a very good opinion of Slavs, Russians, Poles, Czechs—they were very prone to putting them also in these concentration camps where some of my relatives in fact died. It makes me terribly sad to think about that.

My mother got wind of this, and she, a completely unsporting kind of a person, during the winter season, which is very severe in Bohemia, put me in a rucksack and skied across the hills into Austria. From Austria she then went back to the house near Venice. She could get away with this because she had dual citizenship, being also an Italian citizen, and she figured that if she could get herself to Linz or Vienna or something like that, she could get away. We lived on Lido for the rest of the war, which was relatively mellow, except there was no electricity, gas, water, food, or anything else, and all these bombers were flying overhead. They were all Allied. This was *after* the Armistice of Cassibile,

which occurred in 1943—September 3RD. I started going to school. Of course the only language I spoke was Czech at the time, but here I was in Italy, had to go to school, and I had to learn another language. Later, I was in boarding schools mostly in the foothills of the Alps, north of Venice, which was quite a happy time. In two of the summers, she would send me with some neighbor ladies who I think were Austro-Italian, to their villa in the Dolomites. That was very important in my life, because that's when I learned to love mountains and the outdoors. It was freedom—you never had it, living on that little island, afraid of being wiped out of existence any second.

During all of this time my father was—nobody knew where he was. I grew up without a father. Then in 1947, my mother decided, for whatever reason, it would be useful for me to go to England, where she had a cousin, and there I was, knowing not one word of English. For the *second* time in my life, at age ten, I had to learn a completely new language! Then my father resurfaced from somewhere, and at that point he was managing an airport in Port Sudan, on the Red Sea. He still couldn't leave—not because anybody kept him from leaving, but because he had no job—things were hard at that time in Europe after the war. I met my father who was to me a complete stranger. Not too long after, he basically got me out of England, without my mother's knowledge, and went to Turin in northwest Italy. My mother had no idea where I was. Eventually she found out and collected me, and that started a period of relative stability, because we lived in Rome, and I went to school there and eventually ended up with what is called a baccalaureate in classics, in 1954. That was by *far* the hardest exam that I took in my life, including PH.D.

Well, those exams, there were thirteen subjects. I was in classics. I'd had eight years of Latin, five years of Greek. But we also had mathematics through differential equations, analytical geometry, chemistry, physics, literature, French. The final exams lasted three months. There were thirteen five-hour written exams, and five three-hour oral exams. I knew more than I've ever known since. The next step was going to England again to study aeronautical engineering as a Student Apprentice in association with the Bristol Aeroplane Company. In those days the idea was that if you wanted to be an engineer, you have to know what was going on in the shops: fabrication, machining, welding, riveting. In the evenings and weekends, you went to the university and took courses. And it probably set me on the course of being a person who does everything himself. Then the U.S., but this time I already knew English, although it was English with

a Scot's accent. My roommate and best friend was a Scotsman! (laughs) Combine my present accent with English and Scottish overtones, and you have a little problem.

Previously my mother had applied for an immigration visa to the U.S., because she had gotten to know an engineer from southern California. He was a Caltech product, and he said, "Well, you know, why don't you guys come to the U.S. for heaven's sakes. What are you going to do, rotting in Europe?" My mother had applied—we both came on the Czech quota. I was in England, so had to come back to Rome. I was about nineteen. There were the college entrance exams that I could take in Rome. It is a measure of the excellence of the education that I *had* had, that I took them and I passed and got into Caltech without knowing anything about the American educational system.

Later, I finished my work and got my degree at Penn State. Meanwhile, some friends who were one year ahead of me had gotten jobs here in Flagstaff. These guys had come to Flagstaff because of the Apollo Program. They were with the USGS when the USGS first got started here. They said, "Well, why don't you apply? You might get a job." I had never *dreamt* I would manage to get back to Flagstaff where I would have been very happy to come back to, but by golly, I *did* get the job with the USGS in Flagstaff. That was in November, 1966, by which time my wife and I had a six-month-old daughter, Maya.

* * *

My mother's favorite cousin after whom I was named—generation-wise he would be some kind of an uncle, Ivo Tonder. I just have to tell you his story. He grows up, as part of the *jeunesse dorée* [the golden youth]. These people could do anything—right? He was interested in aviation. At some point or another, he decided he wanted to fly, so he got a pilot's license. Everything was fine, and then Hitler marches in. Not good. And he didn't like it, he just really hated that. So, he escaped. It was the first of his escapes, and it wasn't easy. He went down through the Balkans into Turkey and ended up in England. Well, he was a pilot, right? In due course he joined the RAF [Royal Air Force], the Czech squadron. There was a Polish squadron, a Czech squadron—who were the fiercest fighters of all, because they *knew* what Hitler was like. They had their countries invaded, and they were really *mad* about that. He flew in the Battle of Britain, flew a Spitfire. And eventually got shot down, so the Germans rescued him, and they put him in prison camp, one of the *stalags*. And guess what? You've heard of "The Great

Escape"? He was one of the escapees, was one of the primary tunnel diggers, and he was also one of the tailors who made all these clothes. He and another companion managed to stay out for a long time, and they made their way to one of the Baltic seaports, with the idea of stowing away. But it turned out to be impossible, there was too much security. They got back on the train and went back either into Bohemia or very close to Bohemia, and their forged papers were really good. And the last inspection, the papers passed, but one of the two policemen said to his companion, "You know, those guys are wearing some pretty strange-colored pants. And the pants are very similar to those of some other escapees that we caught the other day." They got nailed. My poor uncle was sentenced to death in a hundred days. Meanwhile, he was put in a castle that was supposed to be an absolutely escape-proof prison, Colditz Castle. It was mostly peopled by RAF. These crazy guys started building a glider up in the attic of the castle. The plan was that they were going to get this thing up on the roof and one of them, anyway, was going to escape by flying the glider across the river.

As it happens, the Allies came first. No glider escapade. My uncle was saved, because it was before a hundred days. He went back to Czechoslovakia, hoping that he would have a normal life again, and then the Russians arrived. He didn't like that either, and tried to escape. They caught him, put him in some kind of a prison—escaped again. This time he made it, except his family was behind. He had a wife and two kids. One of the stories that I got just recently—and it may not be true—was that the girl was about two years old at the time—they wanted her to get out, and, so, there's the Moldau River that goes through Prague. They went somewhere downstream from Prague, and put this two-year-old in a tube, and consigned her to the river. Apparently not too far downstream she was collected from the river and somehow or other escaped. Then his wife and son got out somehow or other later. They all went to England and lived there. The love of freedom runs strong among the Czechs.

* * *

There were two branches of the survey here in Flagstaff involved in the Apollo moon missions. One of the branches made the geologic maps of the lunar landing sites. The other branch, which was the one that I was in, was more concerned with, How are we going to do field geology on the moon? Which was by no means an easy task—quite apart from the aeronautical space travel problems—you know, the LEM [Lunar Excursion Module], landing the damned thing on the moon.



Al Chidester, Ivo Lucchitta, and John M. Gonigle—USGS photo P929, F1169136 USGS Open-File Report 2005-1190, Figure 071b.—ID. Project Apollo (1960-1973)



Mobile Laboratory (MOLAB) or Mobile Geologic Laboratory (MGL) designed for NASA by General Motors in 1965 for NASA as a prototype, extended lunar mission vehicle; (a) (l to r) Hal Stephens, Ivo Lucchitta, Bill Tinnin, Bob Sutton and two others (unidentified) standing in front of MOLAB; USGS photo USGS Open-File Report 2005-1190, Figure 023a.

First of all, some people thought there were fifty feet of dust on the surface of the moon. If the LEM had landed in that, it would have disappeared. There were other problems like, What kind of tools would astronauts use on the surface of the moon to do geologic work? You couldn't really use a normal compass because there isn't a magnetic field worth beans on the moon, so it would have to be a sun compass. Gene Shoemaker worked that one out and called it a gnomon, a Greek word meaning something that tells you where the truth is, in a way. What kind of procedures would they have to follow? Astronauts are not geologists, so we had to train them. They came to Flagstaff a lot. Some of us spent a lot of time training them in trying to describe things in a manner that people, who could not see what the astronauts were seeing, could understand. You start on the big things. "Okay, in front of me I see a crater. And on the wall of the crater I see a bed. And within that bed I see..."

There was a big question as to whether TV would be

useful. We had some sample tests in the Hopi Buttes where some of us would sit in a little trailer, not being able to see, and there was a guy—including my prof, Richard Jahns—out there doing field work, and we were able to follow him with a camera. We had tests with and without. No contest at all—the camera was essential. Somewhere along the line it dawned on people, "What if Armstrong is going to step off that ladder onto the surface of the moon, wouldn't it be nice to have it on TV?" And the whole world was watching! By the way, the USGS was really *the* outfit, the scientific outfit for the lunar exploration—the geologic maps, the lunar mosaics, the air-brushed lunar maps and charts. Everything! Image processing, you name it, this outfit did it.

Another one of the things that has caught the popular imagination are the crater fields. We used them to train the astronauts. One is out at Cinder Lake. But the thing that nobody remembers at all anymore, if it weren't for so many like me who were involved,

was down in the Verde Valley—a *much* larger crater field than the one here. It was a scale model of one—I forget which Apollo mission it was—they were planning on landing in such-and-such a spot. We made a crater field that was like that spot—not quite as big—we couldn’t make craters that were that big. What the astronauts would learn by going and running around in a place like that—what you have is inverted stratigraphy. If the astronauts are trying to figure out what’s below the ground, they have to remember that it’s going to be upside down in the ejecta on the surface.

QUARTAROLI: How did you make the scale model crater in the Verde Valley?

LUCCHITTA: You know, we had good photographs of the surface of the moon, and you knew the diameter of the crater, you knew the distance, you survey it out on the ground, with a theodolite, and you put pegs in the ground. For each peg you have a table and you say, “Okay, this crater has to be so big,” and we knew what charge it would take to make a crater that big. You load that charge, which was ammonium nitrate, and kaboom! you made all these explosions. You did not make it all at the same time either. You did it in a sequence so that there was an age sequence to the craters. You can tell on the moon from the photographs, because the ejecta from *this* crater are on top of the ejecta from *that* crater, so you can establish an age sequence. We copied that. We actually designed and made two lunar vehicles here in Flagstaff. One was a rover, the little things that look very much like what NASA eventually ended up having on the moon. The other one was a great big thing that could be pressurized and they could sort of live in it. That one never made it at all, it’s in some museum somewhere.

In order to somehow or other record in real time what the astronauts were saying from the moon, we used court reporters because they can type, and you have an output which is on paper basically, because there was really no very good technology of transferring the audio to anything else. The computer power of the Apollo missions—at least of the early ones—was miniscule. Those were the days when you had great big mainframe computers with punch cards, and you certainly couldn’t put one of those on the LEM. They had something that might have had the power of a cell phone.

When Apollo 11 landed on the moon, there was a scene of complete chaos in what was USGS Building 1 up on the mesa. All of us who were in Flagstaff rather than Houston were in one of the bigger rooms, and there were all these photographs of the lunar landings on the moon, and it’s not that we knew they were going to land exactly here. There was a landing ellipse,

which was sort of a probabilistic thing. They were *aiming* for a certain spot, but in reality, they were probably going to land somewhere within that ellipse, because they couldn’t control things that well. When we heard “Eagle has landed,” everybody was crying—you know, staid old scientists—the emotion was so enormous. The question was, Where the hell are they? For quite a long time, nobody knew just where they were. We’re the people who would have known, because they didn’t have GPS. There they were on the surface of the moon. Then they started describing. Eventually, people knew where they were, which was not too bad a place to go within this landing ellipse. Maybe when they landed and deployed the gnomon, they had some vague idea, but you couldn’t position yourself like that.

Now to give you an idea of what things were like in those days, when I did my field work—on earth, you know—on *earth*, where presumably things were better and easier—the only maps that I had available for most of that field area of mine were the army map service, 1:200,000 scale maps, or two-degree quadrangles, with 250-foot contours—that’s it! There *was* nothing better than that. As a graduate student I sat on a great big opaque projector called a Saltzman [Caesar-Saltzman Vertical Reflecting Projector], and by hand, on a piece of drafting cloth—linen—not Mylar, it wasn’t around then—I enlarged the map to a scale of 1:63,000. There was nothing else. Things were primitive.

I was a field geologist, that’s what I wanted to do. Even though I found the Apollo program fascinating, what I *really* wanted to do was to go back out in the field. Apollo was winding down—my next project was a field-based project that still had to do with space stuff. Do you remember ERTS [Earth Resources Technology Satellite], the first orbiting satellite that was taking pictures of the Earth? They had taken pictures, so the thing to do was to see was there any earthly—pun intended—application for these things? Several of us, including Gene Shoemaker and Don Elston and I got involved, working in collaboration with image processing people at Caltech, JPL [Jet Propulsion Laboratory].

* * *

QUARTAROLI: We’re going to get back to the Grand Canyon now. You were talking about you first went to work at the museum, and you were doing some projects for Bill Breed. Maybe you can talk a little bit about the project there, and Bill, and your research at the mouth of the Grand Canyon for your doctorate, what you found out, and what your conclusion was.

LUCCHITTA: Much of the work with Bill consisted of logging well cores from the Saint John's power plant. They were drilling for wells. Then Bill and I went out in the field a number of times measuring sections. Other than that, I don't really remember *too* much, other than this perpetual hoopla about putting together some kind of a Grand Canyon symposium.

When I finished my work at the mouth of the Grand Canyon, the conclusion was that as per Chester Longwell's earlier exploration work, there was no evidence whatsoever of any kind of a free-flowing river coming out of what is now the mouth of the Grand Canyon, until after somewhere between five and six million years ago, which is when the Gulf of California opened. The conclusion was that the river, in its present lower Colorado alignment, only came into existence after five to six million years ago. The logical conclusion would be that the Grand Canyon, as such, also post-dated that age. That's where the five to six million year age for the Grand Canyon came about. This was the conclusion reached by us at the symposium.

Now, there was a puzzle because Charlie Hunt, who was a USGS geologist, had done a great deal of work in the upper part of the Colorado River drainage basin, and collected all the evidence that could be found, and he had concluded that in fact there was a rather *old* Upper Colorado River system/drainage, and, so, the puzzle was, how do we fit these two pieces together, only a *young* Colorado River from the mouth of the Grand Canyon on down, and an older river upstream. That's why Charlie Hunt tried to get out of that by saying, "Okay, the ancient river actually went out along Peach Springs Canyon, but in the *opposite* direction from today's Peach Springs drainage. That is the work that Dick Young did, showing that in fact this was not an escape route for the Colorado River. The conclusion of the 1964 symposium, putting all of this stuff together, was that there indeed was an old river upstream from the Kaibab Plateau, and that this river went all the way to maybe where the mouth of the Little Colorado River [LCR] is today. Then it turned southeastward and flowed along what is now the Little Colorado River, but in the opposite direction, to eventually meet up with the Rio Grande and go into the Gulf of Mexico.

Later, the Gulf of California opens, and the young upstart river starts eroding its way from the gulf—actually, from an estuary that went all the way along what is now the lower Colorado River course up to maybe Parker or Needles. It was a narrow estuary, and the river started working its way headward by headward erosion—a process that some people

don't believe in, except that you can see it all over the place—and eventually went into the upper Lake Mead area, and started carving some kind of a Grand Canyon, but starting much higher up—you know, from the level maybe of Grapevine Mesa today. Continuing to erode headward, it worked its way across the Kaibab Upwarp, and eventually captured the old river that used to go to the Gulf of Mexico. This was the conclusion from the 1964 symposium, trying to tie together the two halves, these seemingly contradictory ideas. This was a major departure from all previous ideas, including Powell, Dutton, Hunt, everybody else, because what was recognized was that a river need not have its present-day configuration all the way back through time. Rivers are parts of drainage networks whose connections can change with time, depending upon all kinds of external factors.

What happened next was that the people who'd been working on the headwaters of the Little Colorado River, what is now the continental divide between the Rio Grande and the Colorado, said, "You know, there's no evidence for anything like that. What we see, as far back as we have records, is that the drainage direction along the Little Colorado River has been to the northwest, the way the Little Colorado is flowing today. McKee and others' hypothesis basically had to be abandoned.

* * *

Meanwhile, I was living in Flagstaff, working as a geologist, keeping my eyes open, traveling around quite a bit, and I sort of learned that you cannot assume that the present-day topography existed in the past as we see it today. I forgot to mention that for McKee and others, the idea was that the Kaibab Plateau was too big an obstacle, and the river couldn't cross it, so that's why we invented this other course. But, a lot of the Mesozoic strata had been eroded since that time. How do we know? Because, for example, you know where Red Butte is—Red Butte is capped by 9.7-something million-years-old lava, and it's got a thousand feet of section underneath it that have more or less vanished from everywhere else. Already nine million years ago, we knew we were way up there. I reasoned that in fact it would not have been a problem for the old Upper Colorado to *cross* the Kaibab Upwarp, going westward. It would have done it in a big wide circle cliffs-type of valley. Circle cliffs are usually formed when you have beds of which one is weaker than the others that curve around the nose of a fold, and that's a preferred place for a river to have a valley.

I said way back when—this was 1975, I think—that

the old, Colorado Plateau river *did* cross the Kaibab Plateau, and then it continued off to the northwest to places unknown. Then the upstart young lower river, working its way headward from the Gulf of California, from the estuary, captured the old river west of the Kaibab and not east. This idea of having to send the old river along the Little Colorado River no longer applied. That is a hypothesis that I think is coming back into fashion nowadays. A lot of people are proposing it, and I'll have to say that the very first people who thought of a valley going across the Kaibab wasn't me, it was two people called [Donald L.] Baebenroth and [Arthur Newell] Strahler, USGS geologists, who were studying the Kaibab Plateau, and proposed this course back in 1945. I did not know that when I proposed my thing, but eventually I learned about it, so the credit goes to them in terms of having a valley across the Kaibab.

Eventually, I mapped the Shivwits Plateau, the western-most of the plateaus north of the river. My base camp was a hundred miles from the nearest paved road. It was remoteness itself, and it took a long time to go in there. I had to map something like 4,000 square kilometers, which is a big area. But it was fascinating, and just recently I have started writing a paper having to do with the Shivwits Plateau in relation to the Colorado River, the Grand Canyon—because there are still people who say, “There was an old river there, an old canyon, probably 70 million years old.” That was the argument of a paper that appeared recently in *Science* and made a *big* splash. Any of us who know what's going on out there in the real world are very unhappy about that—there simply is no evidence on the Shivwits near the canyon of an incision that should be there if there were an old canyon. After the Shivwits, I worked in west central Arizona, west of Wikiup. That's an amazing story, all of its own, but it has nothing to do with the Grand Canyon.

QUARTAROLI: This was mapping?

LUCCHITTA: Mapping, but I don't just map. A geologic map is a basic data set, just like the results of an experiment, which you then use to draw geologic conclusions.

* * *

My first Grand Canyon river trip was in 1971. It was one of Don Elston's research trips. Don was into paleomagnetism, and to do that kind of work you have to drill cores. That's when those infamous holes were drilled. Nobody was thinking, I guess, and Don wasn't thinking, so he drilled where it was convenient. You know, the Proterozoic rock, they're all over



Snout in Lava.

the place. That particular trip coincided with a big flood on the Little Colorado River, which was really flooding—sewers washed out in Winslow. Of course in those good 'ole days we just drank river water, no filter, no nothing, just drank it. Stomach problems were a big deal on that trip.

It was shortly after that—could have been '72, could have been '73—that John Hendricks and I did another river trip. We had our own ARTA-type rowing snout-rig. You know, laden with people, specimens, and geologic gear. And at House Rock, there was never any way of avoiding House Rock—went right through the big hole. I remember hanging onto a line, and my feet streaming out behind me. Fortunately those rigs were pretty stable. We worked on the Cardenas Basalt, the old lavas that you see there near Lava Chuar Rapid. The boat was patterned after the ARTA-rig, but it was our own boat. We went back and did some more work later on, on another trip, which was in June, which was insane considering we were working on those black basalts. We actually did the experiment—we cracked an egg on top of some of that basalt, and it fried, it cooked very nicely. We would start work before dawn, and by the time it got to be ten, that was it. You lay under a bush and then in late afternoon we went and worked again. I remember we were there at Lava Chuar, lying under a bush, and some river trip comes down and says, “Ah! that must be the USGS research trip. Look at them working hard!” I was ready to tell them, “*You* go out there at noon and see if you can do it!”

We worked in the Lava Chuar area and down into Basalt Canyon. We learned a lot about those flows, including the age. That's when the 1,090 million years age came out. We didn't do the dating, but somebody that worked with us then did—Ted McKee, who was Eddie McKee's son. We learned a lot, but it was for me a side thing, because I'm not into rocks of that age at all.



Camp scene.



Research raft with Jack Coffman's sea kayak on board.

kinds of private trips in the wintertime—you know, slack season—and a lot of people came along and helped out—soil scientist and some other people, geochronologists. We studied in detail several areas: Lees Ferry, Nankoweap-Kwagunt, Chuar Lava Creek to Unkar, and the area around Mile 205.

QUARTAROLI: What did you learn from that? I know you can't go into everything, but some kind of highlights from those?

LUCCHITTA: One very important one was that—as might seem obvious—the river has been cutting down with time. You have all these terraces that represent the river stand, the flood plain, at several times in the past. Just to give you an idea, at Lees Ferry, you know where Johnson Point is? That's the mesa behind the water tower. That used to be the bottom of the river bed at one time, two hundred thousand years ago, approximately. That much downcutting is something that happened in two hundred thousand years, two hundred fifty. Similarly, going up and down the river, there are old terraces that are twenty thousand, forty thousand, sixty thousand years old, a hundred thousand years old. We mapped all those out and had a feeling as to how fast the river was cutting down. The really interesting part was that when you're

In the nineties, I think it was, the beginning of the nineties, a project came along. I started working with Dave Wegner in GCES, Glen Canyon Environmental Studies, and something came up that I was *very* interested in, which was trying to understand the effects of Glen Canyon Dam on the downstream reaches by comparing what was going on before the dam was built with what has been happening since. In other words, it was a matter of mapping and studying the pre-dam deposits going back quite a ways—the quaternary stuff, meaning a million and a million and a half years. In practice, it was all much younger. That work went on for five, six, seven years. We had all



Crossing at Basalt Canyon, ca. 1972.

going along the river, the lowest of these terraces is about thirty feet above the present river grade.

Do you know where Axe Handle Cove is? It's the first big bend to the left downstream from Lees Ferry. Have you noticed those muddy-looking tan-colored deposits? We looked at the charcoal layers in the deposits, and dated them, and found that approximately the top three meters have artifacts and hearths; and then below that, nothing. That lowest charcoal layer was about 5000 B.P., 3000 B.C. This deposit has been looked at by a number of people, and papers have been written saying that's a flood deposit. Sand and silt settled out on the inside of a bend, where there is slacker water. But this doesn't work because in the first place you find this material also on the *outside* of the bend. Then, down below Chuar-Lava Creek, the river is straight, but there's a continuous band of deposit all along the river. Comanche, Espejo—it's there. It's not a backeddy. So, it's not a flood deposit. It's what we would call an aggradational deposit. The river was overloaded and built up its bed. That's what a river that's overloaded does. It doesn't have enough *energy* to carry its load. You see the deposit all the way down to the mouth of the canyon.

Many years ago, Ken Hamblin said that the deposit was laid down in a lake that extended all the way to Lees Ferry and had been formed by a lava dam. As with Lake Powell and Lake Mead, the deposits would have started where the river entered the lake, and would have gradually filled the lake in a downstream direction to near the surface of the lake, which was horizontal. Since the river had a gradient, the top of the deposits should be higher and higher above the river, so thicker and thicker as you go downstream. But, what do we actually see: the deposit is everywhere of the same thickness, and reaches about ten meters, or 33 feet, above present grade. All in all, the deposit is not explainable by either floods or a lake, and the only reasonable idea is that it is aggradational—the river building up its bed. The terrace formed by this deposit is especially well developed between Espejo and Comanche. One day I was walking in this area with a soil scientist who knows a lot about agricultural soils, and he said, "You know, this is really good agricultural soil around here. Hmm, interesting."



Recording soils data.

I noticed little gullies, maybe three feet deep, developed in this surface. I said, "What are those dark lines in the walls of the gullies?" I looked at them more carefully and I realized they were charcoal layers, and not just one, but a whole bunch, and quite extensive laterally. Later we did a little trenching and sampling at this locality. There were about five or six or seven of these charcoal layers. The amount that we trenched, it might have been perhaps a meter, a meter and a half. We had three of the layers, the youngest/highest, the middle, and the oldest/lowest, dated by Carbon-14, and we looked for pollen in all the layers. You know what the pollen came out to be? Corn, maize. The palynologist that we worked with said, "Corn pollen does not travel, it does not blow in the wind, which is why in many places people hand pollinate the corn." She said you can go in the middle of a corn field, sample the soil, and you won't find corn pollen, which means that if the corn pollen is there, they were growing corn *right there*. It was not fires upstream that produced the charcoal—the charcoal layers are from when they were burning the stubble. The picture that emerges is that the river at that time—which is what I had concluded from looking at this deposit—was a braided stream, like the ones that you see in Alaska, an overloaded stream, which was very close to the level of the then flood plain. Every so often, every year, every two years, every three years, the river would go *over* bank, just like the Nile in Egypt, wash out the salt deposits which otherwise would be there, provide new silt, and this enabled the farmers to keep on farming. We knew this

happened because the sites, the structures, the hearths, all are buried by the top three meters of this deposit, which had the pollen and the artifacts, and evidence of culture. We knew at this point two things: the river was building up its bed with time; and we knew that they were farming maize.

The next question is how about the ages? It turns out that the *youngest* of these charcoal layers was about sixteen hundred and something B.P., “Before Present,” Present defined as 1950. The *oldest* layer that we both dated and had pollen from was 3250 B.P., which puts it into 1300 B.C. Unfortunately, the bottom layer that had corn in it, we did not date. We only dated top, middle, and bottom of the charcoal layers, because that’s all the money we had. What does 1300 B.C. mean? That was roughly the time of the New Kingdom of Egypt—the great Pharaoh Ramses II, Tutankhamen, Moses leading the Israelites out of Egypt. That’s completely fascinating, because it means that these people out here in the back woods, in the bottom of the Grand Canyon, were farming *way*, way back in time and history.

The other thing that came out of that is when did they quit? It seems to have happened when the river stopped building up its head and started cutting down. Many of the sites and artifacts are Pueblo II [900–1150 A.D.]. Around Tanner Delta, there’s a structure that’s on top of this deposit, it’s not buried, showing that

aggradation ended near the end of Pueblo II time. One can draw interesting conclusions. One regards the site river right a little upstream from Unkar delta. This site used to be called the Ivo site because I found it during my geologic work. The site has been studied extensively by archeologists. In the reports, the site is described as being covered by flood deposits. I instead think it is buried by the same aggradational deposit that buries other sites all over the place, about ten meters above present grade.

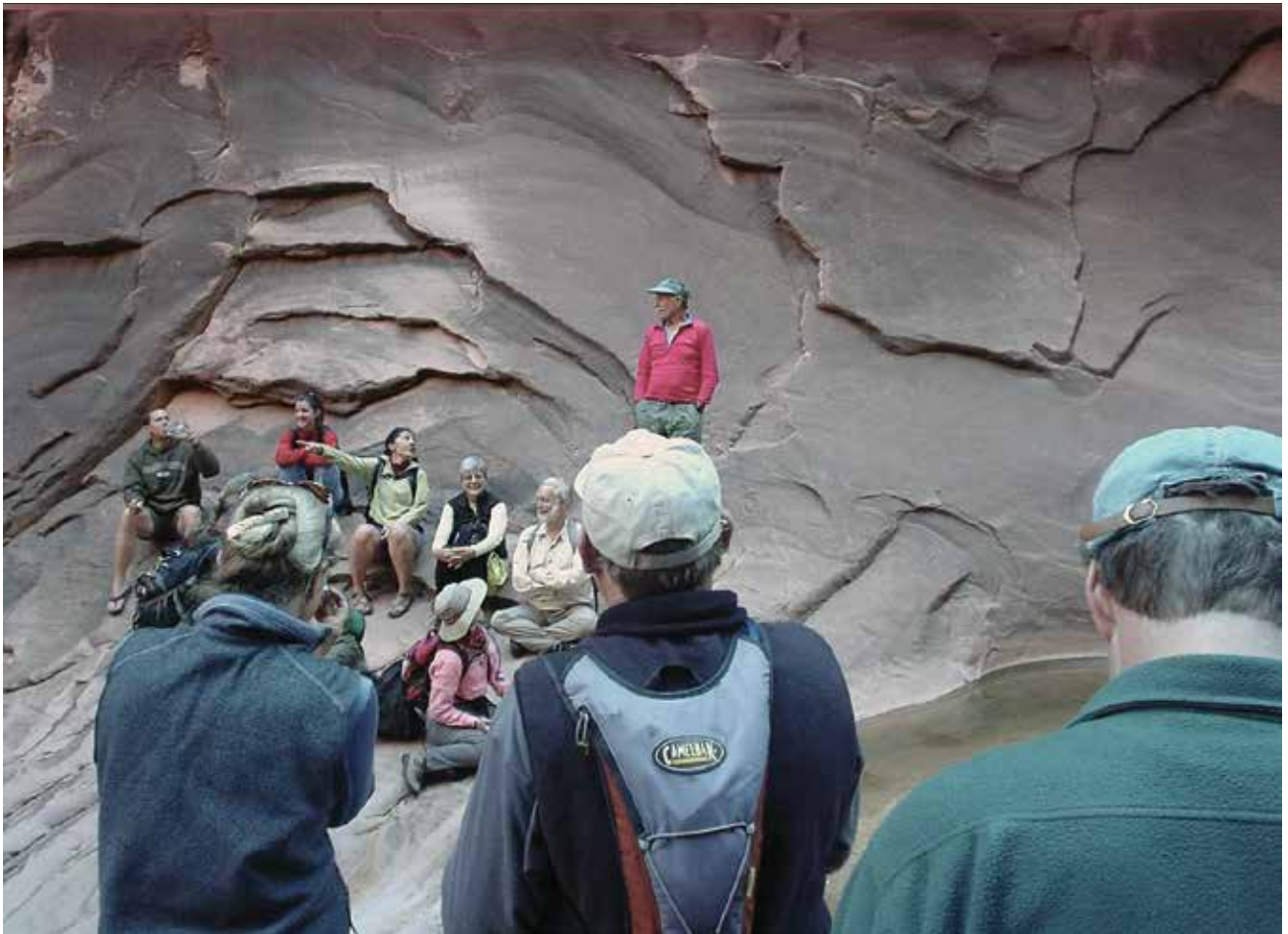
The other thing that’s really totally fascinating is—and one ought to ask one’s self—Why would anybody be down farming the *present* river? I mean, all there is are boulders, gravel, and sand! But at the time in question, Pueblo II time, here was this broad flood plain with the river just a little bit below the level of the flood plain. Groundwater would have been only a little below the surface, so probably the roots of the maize could reach moist ground. Even if they couldn’t, you could easily make a ditch to irrigate. What happens after the time when the river stopped building up its bed and cut down to the present level? Remember, thirty feet down, compared to when they were farming. The first thing that happened was that the river became entrenched. There was no more groundwater available for the roots of the plants, you couldn’t build ditches anymore because the river was way too

far down. Then there is the sand that composes the aggradational unit. It is derived from the Mesozoic rocks that are composed of ancient dune sand, like the Navajo Sandstone. How do we know? Because if you look at it with a hand lens, the sand is very fine-grained, very well-rounded, and the grains are frosted—all of which is indication this was a wind-blown sand once upon a time. When moist, this sand stays in place, but if it is dry—what does it do? It blows, it makes sand dunes. That’s why so many of the sites, for example those just downstream from Basalt Canyon, are buried by sand dunes.

So, you’re a prehistoric



Near the Comanche Creek farm ground.



North Canyon pool discussion on how the rock sheeting formed.

Puebloan farmer. You can't irrigate, the corn doesn't get any water anymore, and you're living in the middle of a sand dune. What are you going to do? Leave. It was *not* because there was a drought. There may have *been* a drought all right, but the river was the one place where there was a reliable source of water. That would have been the *last* place you would abandon. There were probably hostile people coming in about that time, so the departure was probably caused by a combination of things. But the moral of the story is, those sites were not buried by flood deposits, and the people did not leave because of drought. Sometimes, great progress is made when different disciplines are applied to the solution of a problem. All this is so fascinating. In fact, for me, these anthropologic findings are probably one of the most interesting things that came out of my Grand Canyon work.

I'm still working on that and writing papers. I've done a whole bunch of maps of the river corridor. By that, I don't mean just the river and the shore—the whole bottom of the canyon, all the deposits that are

not bedrock. That's what we did, we mapped all those, and it's kind of fun.

QUARTAROLI: Does the USGS have those available?

LUCCHITTA: No, they're not available at all because I haven't finished them. The big snag right now is to get the maps digitized, which is expensive. The next snag is that the USGS now wants money for editing, and I don't have money for either job, so I'll have to figure out what to do about that.

I've been on a number of the GTS river trips, float trips, down to Phantom. I try to talk about this kind of stuff, and people seem to be *very* interested, and they *really* like those charcoal layers—*everybody* does. I've taken a whole bunch of private, charter-type river trips down, for maybe the last thirty years—organized them for those who have an interest in geology. You can tell people, "Oh yeah, here's the Kaibab"—and this goes in one ear, out the other. What's really valuable is to get people to be curious and to be sensitive, and to notice, How come this is here? What does it mean? When you do that, people are never going to be bored. You may

not know the answer, but you can go and find the answer somehow, one way or the other, and it's fascinating. For example, North Canyon, I always take people up there. There's a very good reason for that U-shape. It's the same reason why the domes in Yosemite are also U-shaped, but the other way around.

QUARTAROLI: Could you touch on that a little bit—because I always found North Canyon very interesting, and wondering where else in the Grand Canyon that you could see something similar to that.

LUCCHITTA: You can see something *related* but not necessarily similar. There you are, up at the little pool at the end. Here you have the rock wall, the Esplanade Sandstone with thousands of feet of rock above, an incredible pressure within the rock. Then you go beyond the rock wall and you are at atmospheric pressure. There's a huge pressure difference right at that interface. Things have a tendency to happen there. They're especially good at happening if you have quartz involved, and that is a quartz sandstone. Yosemite is a granite that also contains quartz. Quartz has an interesting property, which is that the quartz crystal tends to be sort of elongate. The direction of that elongation is what we call the C-axis. In quartz, the C-axis has the interesting property of being like a spring—you can compress it a little bit, and then it likes to expand back to its original position. In Yosemite, the quartz crystal solidified under huge pressure. When the magma was way down there at some huge pressure, that quartz was compressed. But now it comes close to the surface and it can release the pressure (pop!). You break the sheet of rock off. In North Canyon you have *exactly* the same thing. All the quartz crystals with the C-axis oriented perpendicular to the wall of the canyon want to expand. At some point what happens is that the strength of the rock near the free surface, near the wall of the canyon, is less than the force of the quartz crystal trying to expand, and the rock pops. One of those sheets pops.

The next question is, Why are they curved? When you think about it, if you have a sharp angle like this, let's say the bottom of a canyon wall, the rock of the

wall is free to expand into the canyon, but the rock right at the corner is not so free to expand because it's being buttressed by the wall above and the floor beside it. The corner is the place where you have the *least* expansion going on. So the wall gets carved back while the corner stays in place, and eventually you get the curved shape that you see.

QUARTAROLI: Yes, what always threw me was that you think that those are layers.

LUCCHITTA: No.

QUARTAROLI: The way it was deposited, why did they bend like that?

LUCCHITTA: Look carefully the next time you're there



Introducing the river trip at Lees Lookout, Lees Ferry.

and you will see little laminations in the sandstone. They are depositional and go right across the sheets or joints, so it is not the lamination or bedding that is bent. Now, if this is a viable idea the sheeting should be visible wherever you have a free surface, right? Below North Canyon, if you really keep your eyes peeled, you will see some massive sandstone layers that are maybe ten, fifteen feet up from the boat when you're going downriver. You will also see cracks parallel to the free surface. We call them exfoliation cracks—they're always parallel to the free surface. Big pressure inside the rock, little pressure outside and "crack!" off it goes. Once you start noticing something, you're going to observe it when you know what's going on.

I've been on a lot of river trips, not just the teach-



Ribbon of Time.

ing trips, but, also, my research trips. Oh, probably around seventy, or something like that. It's not bad, for somebody who's not a boatman. I do know something about the river—in a different sort of a way from the typical boatman.

[(March 14, 2014, follow-up.) Over the past thirty years or so, I have led many geologically-oriented river trips. Some have been for the Geological Society of America, others for various research or teaching organizations, many for private parties, and I have even done several of the Guides Training Seminars on the river. The last trip was one year ago [2013] for a group known as the Geologists of Jackson Hole.

During these trips, I really try to do something other than just telling people what geologic formations they are looking at. That is not ignored, of course, but what I am most interested in is for people to become curious and ask themselves questions—sort of the incredible weirdness of things. I really do believe that if people are observant and curious and try and find out why things are the way they are, those people will never be bored in their lives. Our country desperately needs people who are curious and want to find things out.

Another of my favorite topics is to try and give some physical feeling for geologic time. It is easy enough to talk about one million years, but what does

this number *really* mean? One way to make it understandable is to express it in terms of something that everyone can grasp—human generations, taken at twenty years each. Our recorded history is about 6,000 years, which would be 300 generations. The birth of Christ is about 100 generations back, and the fall of Homer's bronze-age Troy about 160. But one million years contains 50,000 generations! That boggles the mind.

The next is to try and represent the age of rocks in the Grand Canyon using the scale of one centimeter per million years, keeping in mind what we have just learned about the meaning of one million years. I have plotted this on my famous, or infamous, "Time Scroll." The scroll is a roll of printing calculator paper, which is about 17 ½ meters long, or 58 feet. It represents the time recorded in the Grand Canyon at one centimeter per million years, or about 0.4 inches. Does that give some idea of the time represented by the rocks?]

* * *

QUARTAROLI: You said you also had your own raft, and you've floated a lot of other rivers.

LUCCHITTA: I used to have an NRS Sport 1—the original Sport. There was a group of us who did a lot of trips. What have I done? Yampa, San Juan, Middle



Fork, Desolation, some other ones I'm sure I'm forgetting now. We used to do that quite a lot. And the Dolores—which is the one with Snaggletooth. It's an interesting river. I mean, it's so different from, let's say, the Grand Canyon. Narrow, no backeddies, no nothing, you just book down the river. Snaggletooth is about as exciting as anything, as far as I'm concerned. Then eventually we got fed up for a variety of reasons, but one was that permits game. You know, you used to be able to do the San Juan just by going down. My wife used to do it in a Sportyak and had great fun in that.

QUARTAROLI: With these other river trips, geologically what did you find interesting, going on the Yampa and the Dolores? You were doing your work and research in Grand Canyon, but what did you like about the other places?

LUCCHITTA: It's kind of funny, because a lot of the time, if you're a geologist, I mean, that's *vacation!* I wasn't worrying *too* much about the geology, *but* there was still some interesting things. For example, on the San Juan, which we went on quite frequently, down to Clay Hills, one thing that we were quite intrigued by—my wife and I—was that downstream we used to like camping river left, just downstream from Grand Gulch. There was some current and there were some nice ledges twenty or thirty feet above river grade. With time the river was rising and rising and *rising*,

approaching these ledges. It was not because the river was getting deep, it was always quite shallow. But the whole shebang, the bottom of the river and the river itself were rising. They were doing that because of Lake Powell. What you were seeing was basically the delta of the San Juan into Lake Powell. Except in this place it was still in the canyon, so it wasn't the kind of a delta that you think of—it was a constricted delta. But the whole thing was rising. We've had people not believe this, but the facts are there.

Another thing that was interesting, the *only* time we were going to go past Clay Hills to that take-out. It used to be all lake, right? We had been hearing rumors about "the waterfall." It was an incipient waterfall. It wasn't a normal rapid at all. It was like a weir, a diversion dam, a very sharp thing, and a very nasty keeper hole down below. We did okay. Even my wife in her Sportyak did okay, we got through. The river was flowing over its deltaic deposits and did not know where the former channel was, so it went over a ledge that used to be on the side of the canyon, much like the rapid below Pearce Ferry.

* * *

Did I also tell you that I studied the shorelines in the Grand Canyon? In mapping, you map everything,

right? You see shorelines, driftwood lines, at the old high flood stands of the river. You have to remember that a driftwood line means the highest stand, because otherwise it would be washed away as the water rises. I could recognize the 1884 300,000 CFS line, because it had these huge trees in it, and almost no artifacts, except a few hand-worked mine timbers—you know, adzed kind of things. The next one down was what I believe is the 1921 flood at 200,000. I *think* I had the 1921, but for sure I had the fairly typical flood stage from pre-dam floods, which as it turns out was 125,000—every few years, 125,000. *That* strandline had big trees, being pre-dam, and had *more* artifacts, including steel beer cans, the kind you had to open with a church key—no plastic. The 1983 flood, when the dam almost went, left strandlines with no big trees, only small stuff, because the dam stopped them. You also have aluminum beer cans of the kind with the pull tab that got detached from the can. Those were there, but not the more recent ones with the tab that stays attached, and a lot of plastic. This is the archaeology of the floods and of beer cans. (laughs) Fascinating! I love that kind of stuff. I've written it down, and if it gets preserved, people could, by that means, among many others, sort of say, "Okay, this is when this came in, that's when *that* came in, that's when that came in." It gives you timelines.

Another thing is, in my mind, a very interesting and useful result of my work in the Grand Canyon—although it hasn't done any practical good. In 1993, I think, I was going down on a research trip, and we came down to the LCR, the confluence, and we said, "What's *that* down there?!" When we got a little closer, there were these fifteen-foot standing waves coming out of the LCR. It was a *huge* flood, it was just immense. We figured the combined flow was about 45,000 CFS. From that point on downriver, there were *enormous* sand deposits everywhere. Like at Crash Canyon where the river was quite narrow because there was such a huge sand bank on the right side. The sand was all down the river. It was impressive, beaches everywhere! A year later, they were basically gone. Later, test floods were done of about the same discharge. Again, beaches everywhere, but one year later they were gone. Nature had already done the experiment. There was no need to repeat it.

There's a guy by the name of Luna Leopold [hydrologist, son of Aldo]. Luna was in essence the father of Grand Canyon hydrology. He and I joined forces after the flood, and I presented to him what I knew: the flood, the cumulative discharge, the sand banks,

and the fact that after one year the sand was all but gone. I also told him that the sand in the banks was mostly from the Little Colorado because, number one, it only was present downstream from the confluence; and number two, because it contains basalt fragments, which you don't get from upstream on the Colorado. Luna and I wrote a paper in *GSA Today*, which is available, by the way, on the Web. It was 1999, I think it was. We combined these data with my observations about shorelines and terraces, which told us what terraces retain sand, and what stage, and therefore discharge, you need to reach that particular terrace level. "Stage," by the way, is the height of river water above some datum. Obviously, you need a greater discharge to increase the stage. Luna then used the gage data, and said, "Okay, to get to this level, we need such and such a discharge." Basically, we determined that, in order to park sand where it would not be washed away in one year, you had to have such and such a stage, such and such a discharge. The discharge turned out to be about 72,000 CFS. We then wrote this paper saying, first of all, we need a discharge of about 72,000 CFS. We know that the LCR has a big flood, on average, every seven or eight years. These floods have a discharge of 10,000 to 25,000 CFS. The recipe we proposed was that when the dam operators learn that there is a big flood coming down the LCR, they should release enough water through the dam to bring the combined discharge to 70-72,000 CFS. This could usually be done by discharges through the turbines. The result would be new sand, mostly from the LCR, that would be parked high enough to have permanence. Of course, some sand would be blown into the river channel with time, but this would help restock the channel sand. Our proposal sank like a lead balloon—there was no reaction.

Recently, there have been some signs that our proposal might find some acceptance, but the thought is to use sediment from floods on the Paria rather than from the LCR. This would help restock the reach above the confluence, of course, but there are several drawbacks compared to using the LCR. First, the discharge of the Paria is much less than that of the LCR, and one does need the water. Second, the amount of sediment is much less. Third, a lot of the sediment is clay, not sand. There is nothing to say that both rivers cannot or should not be used, and I hope they will. I also hope that perhaps in my lifetime somebody will read our old paper, and maybe use its data to arrive at a useful solution.

QUARTAROLI: Maybe, when they read this interview in the BQR, other people will take a look at.

LUCCHITTA: Right. See, that's something that the river community would be, I think, personally interested in. The data are there, the observations are there, the Little Colorado is there, it floods—why shouldn't we use it?! Sand bypass tubes are nonsense. I mean, c'mon, guys, what bullshit is that?! If it should happen—which is not that often, I'm sure—but if the LCR *and* the Paria flood at the same time, you've got it made, big time! Here's a means for doing something good, at no cost to anybody, other than the water. What Glen Canyon Dam, what the power people—you know, WAPA [Western Area Power Administration]—has to do is just say, "Okay, we know that this might happen every now and then. Let us be prepared. If we have to send *all* the water we can possibly send through the turbines, let's find a way of doing something with the electricity that would be generated." That shouldn't be *that* hard. There's plenty of warning, because it takes a long time for the LCR flood stage to go downriver. I think this scenario of using LCR floods is a potentially important thing.

One of the great USGS professional papers is PP 669 by Mary Rabbit, *The Colorado River Region and John Wesley Powell* in which Luna Leopold contributed "The Rapids and the Pools—Grand Canyon," and I think Mary Rabbitt's stuff is great, and I think Charlie Hunt's stuff is great. And Luna, I mean, for me it was such an honor to co-author with him. Ours was one of his very last publications. We were actually personal friends. For me, it was just wonderful. Somehow or other, rubbing shoulders with people like that is an honor. I've known him, and I've known Eddie McKee, and I've known Charlie Hunt, though not very well. And Chester Longwell I met. You know, old "Muddy Mountain" Ches. He was in the seventies somewhere, and in the Muddy Mountains—he was running around up there, still doing field work—a true inspiration. Did I tell you that I also met the guy who studied and named the Proterozoic sediments of the Grand Canyon? Levi Noble! He had a little ranch at Pear Blossom, which is right smack on the San Andreas Fault. Typical crazy geologist, his great hope was that the San Andreas would move while he was alive—and it didn't, unfortunately—or fortunately, I don't know. Just think, Noble was out there working in that country when William Wallace Bass was around. Noble was an old guy, a very old guy when I met him. But I met him, and he may well have met Powell! For me it's been sort of living history, actually—with a geological slant—living geological history, going back to the prehistoric Puebloans.

* * *

QUARTAROLI: Do you have any final comment? Because this is Grand Canyon River Guides, we're focused on Grand Canyon/Colorado River, so anything specific.

LUCCHITTA: Let me talk about the Grand Canyon. I think the BQR is a wonderful publication. Hats off to those who got it started. It's class. I've seen it starting, and I hope it continues going well. I don't know anything about the inner workings of BQR, but I think it's a great publication. I think that these historical things [the oral history interviews] are wonderful, but I sort of wonder how many people actually read them. I know I do. It's the thing that I read more than anything else.

QUARTAROLI: You know, comments that come back, it's usually the first thing that people read, or the thing that they find the most interesting, the most fun to read.

LUCCHITTA: Exactly. It's a good way of preserving some truly interesting history. Great. As far as I'm concerned, the Grand Canyon river community is—well, my biased opinion is, if you want to find real people, that's where you go. I believe that. And it's always the same old story: Somebody starts out as a kid, "God, isn't this kind of sexy?" That's how people often start, and then eventually they grow up in a very interesting and mature and good way. On the other hand, they shouldn't do it for the rest of their lives, either, because you get stuck—as we know, from the Whale Foundation and things like that.

I'll expand on that a little bit. I think a lot of kids go to college when they're not mature enough to know what they're doing, or to appreciate—party time! Well, I don't think that's good. But my thinking has always been more along the line that there probably should be some form of national service *after* high school, a couple of years, like the old CCC or something. It doesn't have to be military. In fact, I'd rather that it were *not*, but some kind of public service during which people grow up. They're out on their own, but they have something to do, there are opportunities to learn useful things. *Then* you go to college. Well, I think that in a way being a boatman on the river is very much along those lines. It is, really, don't you think? I think you deal with reality on the river. Of course there's a lot of partying and so on going on, but there's an awful lot of reality there, too.

* * *

When anyone talks about the Grand Canyon and the Colorado River and says Ivo with no last name, there is no doubt they are referring to geologist Ivo Lucchitta. He has been a fixture around the Colorado Plateau for fifty years. Still traveling, researching, and writing extensively, and never one for a lack of ideas, thoughts, and opinions on geology and other topics. I have known Ivo for longer than I can remember, from boatman seminars to research and donations to NAU Cline Library Special Collections. We have met almost annually for lunch and discussions, so it was with great pleasure that I was able to visit Ivo in January 2013, at his home in Flagstaff, for three hours to record the great stories I've been hearing over the years, and also many new ones. Some follow-up clarification occurred in spring 2014. This interview is sponsored by the Grand Canyon River Guides Adopt-A-Boatman program.

—RICHARD QUARTAROLI

All photos courtesy of Ivo Lucchitta, Jan Taylor, and Sid Davis.

SOME REFERENCES AND LINKS TO SOURCES MENTIONED IN THE INTERVIEW :

Cenozoic Geology of the Upper Lake Mead Area Adjacent to the Grand Wash Cliffs, Arizona, Ph.D. dissertation, *The Pennsylvania State University*, 1966.

The U.S. Geological Survey, Branch of Astrogeology—A Chronology of Activities from Conception through the End of Project

Apollo (1960-1973), Open-File Report 2005-1190, BY GERALD G. SCHABER, 2005: <http://pubs.usgs.gov/of/2005/1190/>.

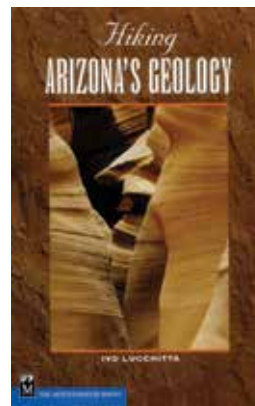
“Remembrance of Things Past,” for more Ivo stories about the Belknaps and early geology on Lake Mead, <http://www.gcr.org/bqr.php>.

Lucchitta and Leopold, “Floods and Sandbars in the Grand Canyon,” *GSA Today*, 9(4)(April 1999):1-7, <http://www.geosociety.org/pubs/gsatoday/archive/toc9904.htm>.

“Kwagunt [A Short Story Based on Close and Personal Relations with Pre-Historic Puebloan People],” www.gcr.org/bqr/17-3/kwagunt.html.

“Into the Canyon, Time, and Silence [A Personal Reaction to the Grand Canyon],” <http://www.gcriverrunners.org/pages/Newsletter%20Archive.htm>.

Hiking Arizona’s Geology, BY IVO LUCCHITTA (Mountaineers Books, 2001).



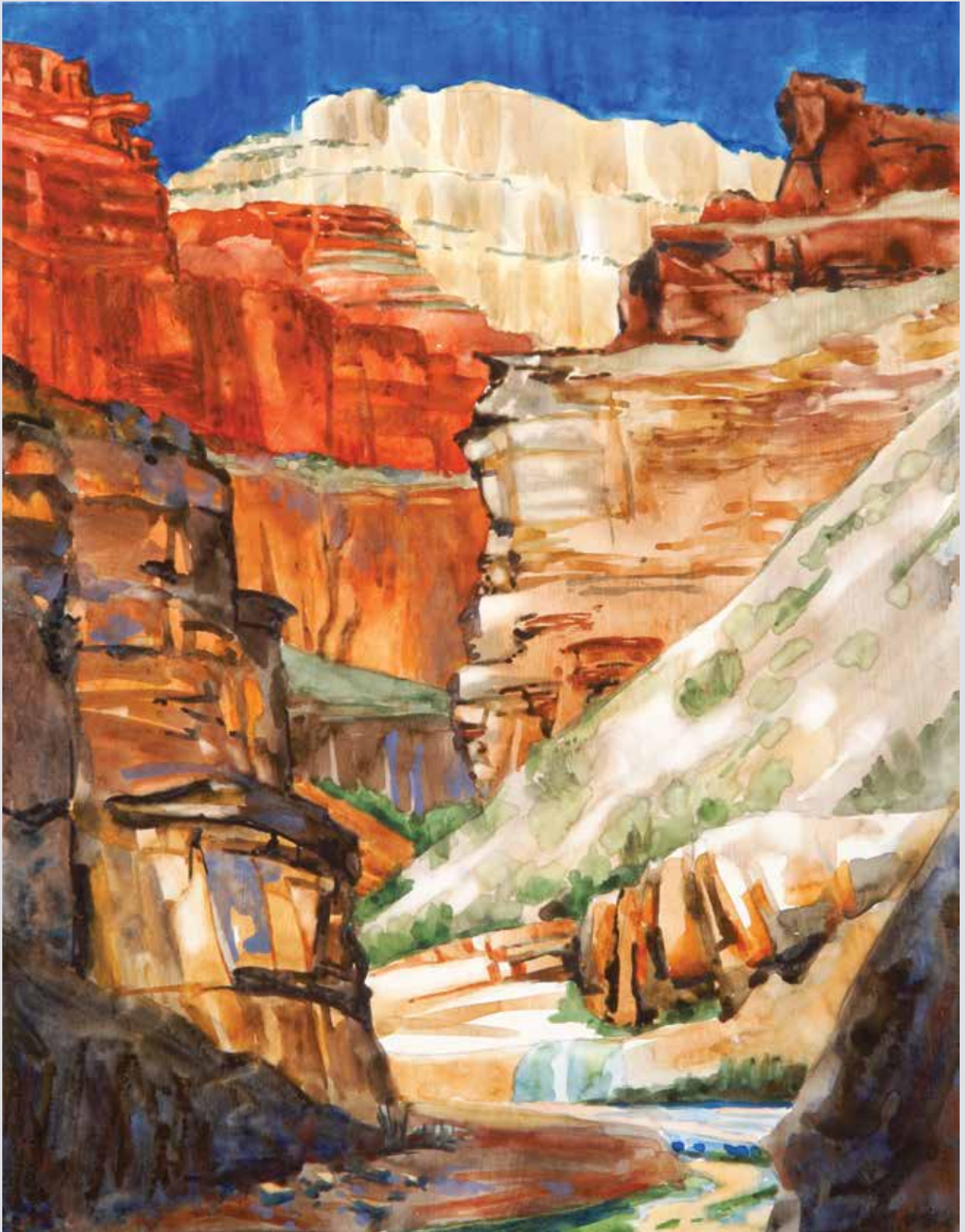
Ivo’s website: <http://www.lucchitta.com/ivo/index.shtml>.

See Early Spamer’s online bibliography for two magnitudes of citations of Ivo’s publications: <http://grandcanyonbiblio.org/>.

Flowers and Farley, “Apatite $4\text{He}/3\text{He}$ and (U-Th)/He Evidence for an Ancient Grand Canyon,” *Science* 338(6114)(21 December 2012):1616–1619, <https://www.sciencemag.org/content/338/6114/1616>.



The top of Carbon Creek slide is a very good place to give an overview of the deformation.



Upper Stone Creek

Suze Woolf / suzewoolf-fineart.com

Congratulations!

Fall Rendezvous 2014



Congratulations "Okie" Jones and Alissa Jansen from Wilderness River Adventures on their recent marriage. It only took nine years and two days to say I do! photo: Cody Bailey (Rogue Images Photography)

WE'RE WORKING ON hammering out details right now, but this is what GCRG's Fall Rendezvous might look like:

TIMING—either the first or second weekend in October

LOCATION—most likely the Page, AZ area. Possibilities include a combination of some of these great options: behind-the-scenes Glen Canyon Dam tour, visiting the *Into the Grand River Running* Exhibit, an excursion on Lake Powell, or a Glen Canyon float trip.

We'll nail down details and get back to you, but count on joining us if you can. Whatever we decide on, it will be super fun and interesting!

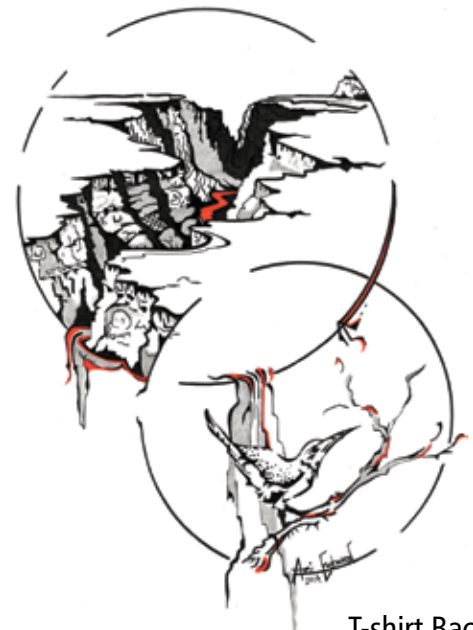
Get Your 2014 GCRG T-Shirts

CHECK OUT THE beautiful new 2014 GCRG T-shirts, artwork courtesy of Ani Eastwood, talented artist and river guide. The design really pops on the shirt colors—"tan" for short sleeved, and the appropriately named "sand" for long sleeved. You can either send in a check to GCRG for \$16 or \$18 respectively, or order them on our website, www.gcrg.org. It's a beautiful design that celebrates the natural world in Grand Canyon, so get yours today!

You can check out more of Ani's work at www.anistubefineart.com.



T-shirt Front



T-shirt Back

Businesses Offering Support

Thanks to the businesses that like to show their support for GCRG by offering varying discounts to members...

- Asolo Productions**—Film & Video 801/705-7033
Aspen Sports—Outdoor gear 928/779-1935
Blue Sky Woodcraft—Dories and repairs 970/963-0463
Boulder Mountain Lodge—800/556-3446
Bright Angel Bicycles & Cafe at Mather Pt.—928/814-8704
Canyon Arts—Canyon art by David Haskell 928/567-9873
Canyon Books—Canyon & River books 928/779-0105
Canyon R.E.O.—River equipment rental 928/774-3377
Capitol Hill Neighborhood Acupuncture—206/323-3277
CC Lockwood—Photography books 225/769-4766
Ceiba Adventures—Equipment & boat rentals 928/527-0171
Cliff Dwellers Lodge, AZ—928/355-2228
Design and Sales Publishing Company—520/774-2147
Down By The River Productions/FaheyFoto—928/226-7131
Entrance Mountain Natural Health—360/376-5454
EPF Classic & European Motorcycles—928/778-7910
Five Quail Books—Canyon & River books 928/776-9955
Flagstaff Native Plant & Seed—928/773-9406
Fran Sarena, NCMT—Body work 928/773-1072
Fretwater Press—Holmstrom & Hyde books 928/774-8853
Funhog Press—AZ Hiking Guides 928/779-9788
Hell's Backbone Grill—Restaurant & catering 435/335-7464
High Desert Boatworks—Dories & Repairs 970/882-3448
Humphreys Summit—boating & skiing gear 928/779-1308
Inner Gorge Trail Guides—Backpacking 877/787-4453
Jack's Plastic Welding—drybags & paco pads 800/742-1904
Dr. Jim Marzolf, DDS—Dentist 928/779-2393
KC Publications—Books on National Parks 800/626-9673
Kingsmark Kennels—Flagstaff pet boarding 928/526-2222
The Kirk House B&B—Friday Harbor, WA 800/639-2762
Kristen Tinning, NCMT—Roling & massage 928/525-3958
Laughing Bird Adventures—Sea kayak tours 503/621-1167
Marble Canyon Lodge—928/355-2225
Marble Canyon Metal Works—928/355-2253
Dr. Mark Falcon—Chiropractor 928/779-2742
Moenkopi Riverworks—boat rentals & gear 928/526-6622
Mom's Stuff Salve—435/462-2708
Mountain Angels Trading Co.—Jewelry 800/808-9787
Mountain Sports—928/226-2885
Patrick Conley—Realtor 928/779-4596
Plateau Restoration—Conservation Adventures 435/259-7733
Professional River Outfitters—Rental boats & gear 928/779-1512
Randy Rohrig—Rocky Point Casitas rentals 928/522-9064
River Art & Mud Gallery—River folk art 435/648-2688
River Gardens Rare Books—First editions 435/648-2688
River Rat Raft and Bike—Bikes and boats 916/966-6777
Rivers & Oceans Travel—La Paz, Baja sailing 800/473-4576
Rescue Specialists—Rescue & 1ST Aid 509/548-7875
RiverGear.com—Put "GUIDZ" for discount code at checkout
Roberta Motter, CPA—928/774-8078
Rubicon Adventures—Mobile CPR & 1ST Aid 707/887-2452
Sanderson Carpet Cleaning—Page, AZ 928/645-3239
Sierra Rescue—WFR and swiftwater classes 800/208-2723
Sunrise Leather—Birkenstock sandals 800/999-2575
The Summit—Boating equipment 928/774-0724
Tele Choice—Phone rates 866/277-8660
Terri Merz, MFT—Counselling 702/892-0511
Teva—928/779-5938
Vertical Relief Climbing Center—928/556-9909
Westwater Books—Waterproof river guides 800/628-1326
Wet Dreams—River Equipment and Sewing 928-864-7091
Wilderness Medical Associates—888/945-3633
Willow Creek Books—Coffee & gear 435/644-8884
Winter Sun—Indian art & herbal medicine 928/774-2884
Zenith Maritime Academy—360/296-2747

Care To Join Us?

IF YOU'RE NOT A MEMBER YET and would like to be, or if your membership has lapsed, get with the program! Your membership dues help fund many of the worthwhile projects we are pursuing. And you get this fine journal to boot. Do it today. We are a 501(c)(3) tax deductible non-profit organization, so send lots of money!

You can pay securely on the GCRG website at www.gcrg.org or send a check to: Grand Canyon River Guides, PO Box 1934, Flagstaff, AZ 86002-1934. Note whether you're a guide member or general member.

\$40 1-year membership

\$175 5-year membership

\$350 Life membership

\$500 Benefactor*

\$1000 Patron (A grand, get it?)*

\$16 Short-sleeved t-shirt size _____

\$18 Long-sleeved t-shirt size _____

\$12 Baseball cap

\$8 Insulated GCRG 20th Anniversary mug

*benefactors and patrons get a life membership, a silver split twig figurine pendant, and our undying gratitude.

Box 1934
Flagstaff, AZ 86002

boatman's quarterly review

NON-PROFIT
ORGANIZATION
U.S. POSTAGE
PAID
MEDFORD, OR
PERMIT NO. 110



ADDRESS SERVICE REQUESTED

THANKS TO ALL YOU poets, photographers, writers, artists, and to all of you who send us stuff. Don't ever stop. Special thanks to the Walton Family Foundation, the Adopt-a-Boatman sponsors, "Circle of Friends" contributors, and innumerable GCRG members for their generous and much appreciated support of this publication.

Still Smilin' After 50 Years of Runnin' Rivers



Former Western River Expeditions' boatmen Paul Thevenin, Art Fenstermaker, Art Gallenson, and Clyde Ross Morgan, at Paul's 80th birthday party. Photo courtesy Becky Thevenin Dovenspike.