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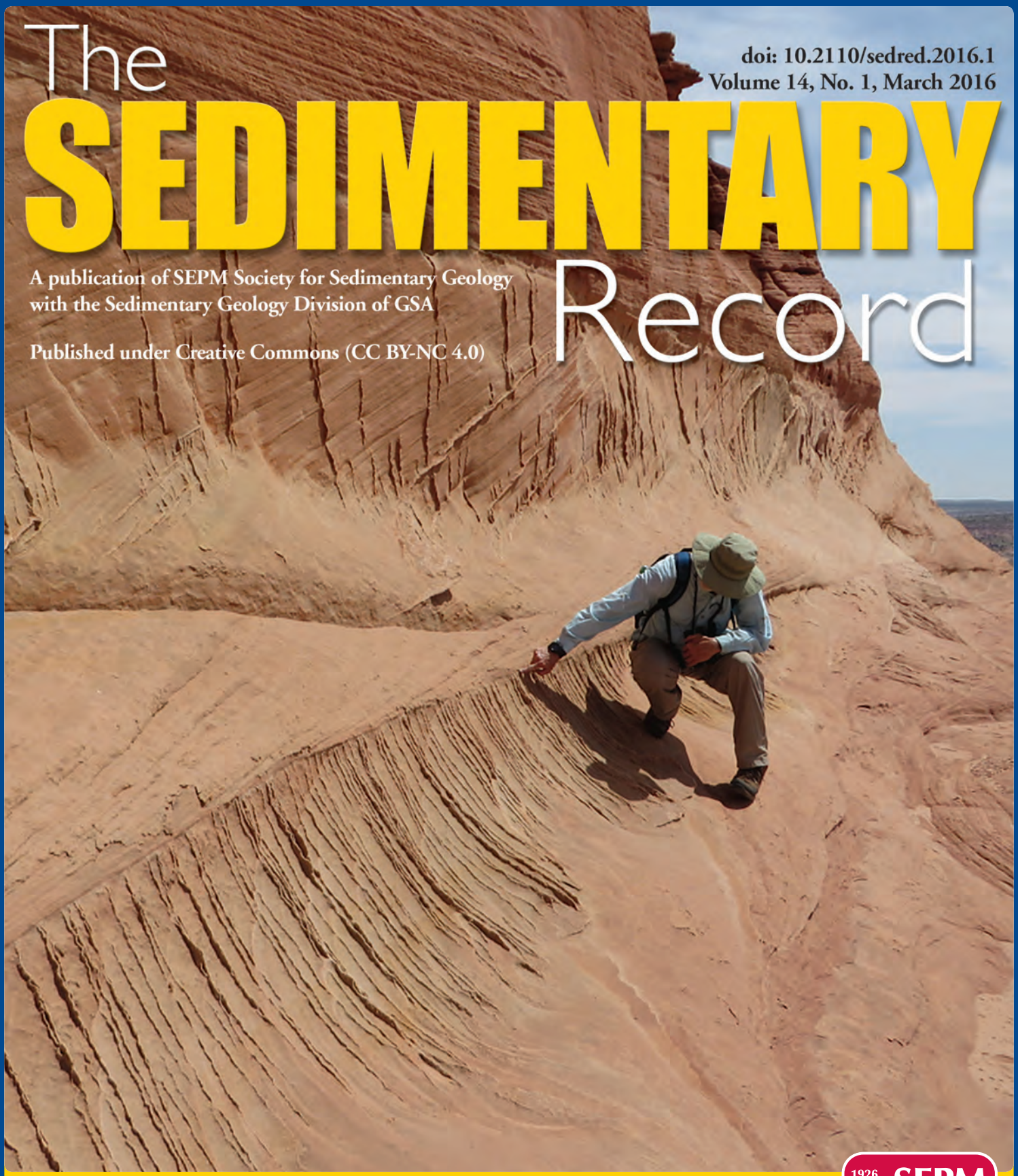

INSIDE: THE FUTURE OF FIELD GEOLOGY, OPEN DATA SHARING AND CYBERTECHNOLOGY IN EARTH SCIENCE

PLUS: PRESIDENT'S COMMENTS, SGD NEWS, SEPM INCOMING COUNCILORS, UPCOMING SEPM CONFERENCES

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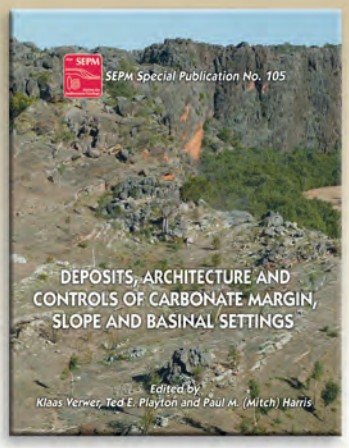

Deposits, Architecture, and Controls of Carbonate Margin, Slope, and Basinal Settings

Edited by: Klaas Verwer, Ted E. Playton, and Paul M. (Mitch) Harris

Carbonate margin, slope and basinal depositional environments, and their transitions, are highly dynamic and heterogeneous components of carbonate platform systems. Carbonate slopes are of particular interest because they form repositories for volumetrically significant amounts of sediment produced from nearly all carbonate environments, and form the links between shallow-water carbonate platform settings where prevailing in situ factories reside and their equivalent deeper-water settings dominated by resedimentation processes. Slope environments also provide an extensive stratigraphic record that, although is preserved differently than platform-top or basinal strata, can be utilized to unravel the growth evolution, sediment factories, and intrinsic to extrinsic parameters that control carbonate platform systems. In addition to many stimulating academic aspects of carbonate margin, slope, and basinal settings, they are increasingly recognized as significant conventional hydrocarbon reservoirs as well. The papers in this volume, which are drawn from the presentations made at the AAPG Annual Meeting in Long Beach, California (USA), in May 2012, as well as solicited submissions, provide insights into the spectrum of deposit types, stratal configurations, styles of growth, spatial architectures, controlling factors behind variations, and the hydrocarbon reservoir potential observed across the globe in these systems. The sixteen papers in this Special Publication include conceptual works, subsurface studies and outcrop studies, and are grouped into sections on conceptual works or syntheses, margin to basin development and controlling factors, architecture and controls on carbonate margins, and carbonate distal slope and basin floor development.

Articles for this volume are available for purchase at the SEPM Online First webpage! http://www.sepm.org/OnlineFirst.aspx

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Concepts in Sedimentology and Paleontology 12

Mudstone Primer: Lithofacies Variations, Diagnostic Criteria, and Sedimentologic–Stratigraphic Implications at Lamina to Bedset Scales

By: Remus Lazar, Kevin M. Bohacs, Juergen Schieber, Joe Macquaker, and Timothy Demko

More than two-thirds of the sedimentary record is composed of rocks dominated by grains smaller than 62.5 micrometers. These fine-grained sedimentary rocks serve as sources, reservoirs, and seals of hydrocarbons, influence the flow of groundwater, and can be rich in metals. These rocks have long been mined for clues into the past global carbon, oxygen, sulfur, and silica cycles, and associated climate and oceanography. These rocks are heterogeneous at many scales and formed via a range of depositional processes. Recent developments in drilling and completion technologies have unlocked significant hydrocarbon reserves in fine-grained sedimentary rocks and have triggered an explosion of interest in the sedimentology, stratigraphy, and diagenesis of these rocks. This Mudstone Primer covers this variability to better characterization and interpretation of mudstones. Definitions of key terms and a naming scheme for mudstones are provided followed with practical steps for studying mudstones in thin sections. Additional guidelines and a set of tools that facilitate consistent, repeatable, and efficient (time wise) description and capture of mudstone variability at thin section, core, and outcrop scale are included in seven appendices. This Mudstone Primer includes hundreds of Paleozoic to Tertiary examples of physical, biological, and chemical features that illustrate mudstone heterogeneity at lamina to bedset scales. The authors hope that individual workers will take the provided examples and interpretations and use them to enhance their own investigation strategies.

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Cover image: Field studies utilize complex observational data at a variety of spatial scales. The outcrop of the Jurassic Navajo Sandstone from southern Utah, exhibits a variety of mesoscale features including bedding, primary sedimentary structures and grain textures, diagenetic features, and superimposed compaction bands (vertical "squiggles" superimposed on the crossbedding). All of these features need to be included in a data system, as they are critical to interpretations of depositional environments and Earth history. The strength of a digital database is that it would allow more direct comparisons to other areas, provide context for other studies (e.g., paleontology, hydrology, etc.), and allow investigators to ask new types of scientific questions.

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Editors

SEPM Staff

SEPM Council

The Future of Field Geology, Open Data Sharing and CyberTechnology in Earth Science

Marjorie A. Chan, Shanan E. Peters, Basil Tikoff

ABSTRACT

The central argument of this article is straightforward: ***Sedimentary field geologists must combine efforts and contribute to digital knowledge bases, or our data will simply be ignored***. If sedimentary geology data are not integrated into cyberinfrastructure initiatives, our progress will be impeded and our data and knowledge will become marginalized. Here we outline how the digital approach can move our community forward while simultaneously transforming the way we conduct science. Open data sharing will enable new collaborations, lead to new visualization developments, and enlarge our societal impact by increasing our ability to communicate our understanding of Earth system processes. We highlight current activities that can facilitate digital transitions, to allow us to fully capitalize on cybertechnology.

SEDIMENTARY DREAMS

What is the ideal future for sedimentary field geology? What if you could access all the original data for work that had been done on an outcrop, or even on the region at any spatial scale? What about accessing all the work done in allied fields (structural geology, geophysics, etc.) on that area or site? How about clicking a button and having any scientific paper that used data from the specific outcrop be immediately accessible? Web search engines, GPS, and visualization platforms, such as Google Earth, have certainly changed the way we find and locate information, but technology is on the cusp of being able to help us do so much more. Earth science combined with cyberinfrastructure can empower breakthroughs to allow us to meet the challenges of our science in transformative ways.

New technologies can help the field sedimentologist in two different but fundamentally important ways. First, they can completely change ***how*** we conduct fieldwork. Imagine being in the field with a new generation smart notebook or phone (with a very long battery life) that can sit in your pocket and automatically locate where you are. You can start talking about your observations while a voice-activated program records and conveniently puts your verbalized thoughts into a digital field system that can be easily queried while in the field and later accessed from any device or computer. Hands would be free to take samples and photos. It would be easy to click on your locality with the GPS coordinates or a map, and have access to any geological information related to that spot with the ability to zoom across multiple scales. This information includes maps, cross sections, stratigraphy, subsurface data, paleontological identifications, photos, sample information, age dating, mineral analyses, microscopic images, and other types of sample-based data. Interoperability and open data sharing would allow digital manipulations, comparisons, or visualizations across multiple data sets in the office or as you sit on the outcrop.

Second, technology can completely change ***what*** we work on in the field. What we choose to measure in the field is generally a result of what one person can carry and do with a paper notebook. When that limitation is removed – and one has direct access to the details of prior research, or assistance from airborne robotic scouts – one can start to pose new and different questions. Having access to more information in an interactive way might: a) change how much time we might spend at an outcrop, b) direct what kind or level of data or observations we would look for, and c) influence what we might sample. In short, it might help us prioritize fieldwork and data collection so as to maximize its scientific impact. Moreover, if previous research and metadata were automatically pushed to your device while in the field, it might be possible to generate hypotheses that are not otherwise formulated until a large amount of work has already been done. Interacting with what is known as we make new observations is not only time-saving, but would increase our knowledge base, and its discoverability, almost instantly.

SEDIMENTARY REALITY

How realistic are these scenarios for future sedimentary research? Although there is still a long way to go, incremental steps are bringing elements of this vision ever closer. In large part, rapid movement on this topic has been prompted by the U.S. National Science Foundation (NSF) EarthCube initiative, which is a collaboration of NSF's Division of

Advanced Cyberinfrastructure (ACI) and the Geosciences Directorate (GEO). The goal of EarthCube is to catalyze basic geoscience research, and maximize return on data acquisition and data repository infrastructure investments, by leveraging advances in information science and technology (Richard et al., 2014). In the formative governance stage to shape the community processes, EarthCube teams and leaders have articulated strategic visions and roadmaps for the future (www.earthcube.org). EarthCube's Council for Data Facilities serves in a coordinating role for existing and emerging geoscience data facilities having significant federal funding. In the initial conceptualization stage, many of the geoscience subdisciplines including the sedimentary community (Chan and Budd, 2013) held EarthCube workshops to discuss discipline-specific needs and priorities. Other field subdisciplines, such as the structure-tectonics, geochronology, and paleobiology communities expressed similar needs (all community EarthCube reports are at: earthcube.org/type-document/workshop-reports).

NSF is currently funding pilot projects (Gil et al. 2014) called building blocks (BBs) and research coordination networks (RCNs) to lead up to an implementation stage for EarthCube components. Paleobiologists have already organized and built on the momentum of a number of existing data repositories (e.g., Neotoma and the Paleobiology Database), and these are now coordinating development and community organization activities more closely than ever as a result of EarthCube. However, the two subdisciplines of sedimentary geology and structure/tectonics typically collect individual, personalized data in field notebooks and currently have no major shared data repositories. But, even this is changing. The structural geology and tectonics community is currently developing a data system for inputting field data (named Strabo). ***Sedimentary field geologists must also figure out a way to get our data into a digital format or our data will simply be ignored***. Our data are critical to establishing an environmental and temporal framework for many other Earth science subdisciplines. Certainly, one way forward is for these field-based disciplines with similar needs to partner together to create field observation data repositories. Collectively, we will be able to do revolutionary types of data analysis once we have a comprehensive pathway for field geology data that spans data collection, data integration and analysis, and data publication in sustainable repositories (Fig. 1).

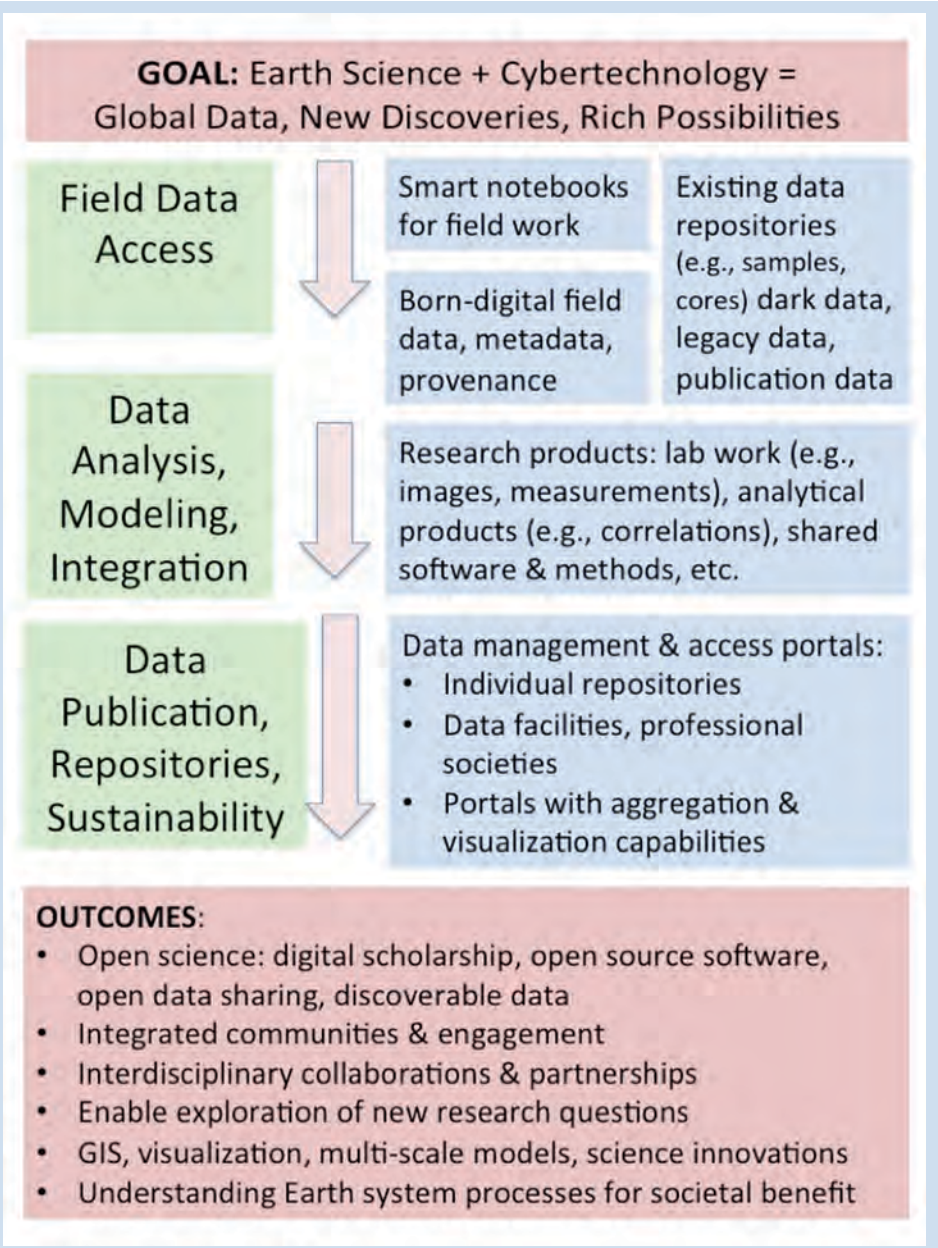

Figure 1: Potential workflow for capturing input field data, research products, and publishing outcomes for sedimentary field geology.

For an effort like EarthCube to succeed, the social hurdles of bringing scientists and technologists together must be overcome. Communication and collaboration are important to unite the diverse stakeholders involved in EarthCube. The cyber community has a strong interest in working with geosciences data (see Gil and Pierce 2015). A fast growing group with a similar vision to use cyber technology for Earth science problems

is the Federation of Earth Science Information Partners (ESIP Federation) - an open, networked community that aims to bring together science, data and information technology practitioners. While ESIP addresses some Earth science research, it does not yet reach into all of the geoscience disciplines.

To get the best outcomes for the Earth sciences, it is critical that scientists communicate and work with the information system specialists who will design products that reflect how scientists collect and ultimately use their data. An EarthCube RCN for field science fostered interdisciplinary communications and field-oriented exchange between scientists and technologists, and revealed the need for more comprehensive field hardware and software, standardization efforts for field metadata, and comprehensive data repositories for field data (Mookerjee et al. 2015a, b). A critical message is that scientists need to be heavily involved in the articulation of needs and in the design of technology so that the cyber-tools are developed to meet scientists' requirements, as opposed to scientists being expected to adapt to new technologies that do not fit the way we conduct science.

GLOBAL OPEN DATA SHARING

In our virtual world, we want to go to our computers and have instant access to all known information. That goal is achievable if we can start to archive data in revolutionary ways, akin to digital books, but with deeper levels of contextualization and machine understanding of the contents of those documents. We could access not only past journal articles, but past data tables as well without having to laboriously hand type in the data ourselves. GeoDeepDive (geodeepdive.org) is an EarthCube building block project focusing on building that type of reliable, scalable infrastructure to support geoscientists, and other disciplines. The approach is to find and extract data and information that are currently buried in the text, tables, and figures of published articles and reports. Early work by this team suggests that machine-reading approaches to knowledge-base creation can produce useful databases with quality rivaling that of human experts (Peters et al. 2014), but access to documents remains a critical challenge due to existing publisher licensing agreements and other basic access limitations. These challenges are slowly being overcome, and to date, the GeoDeepDive team has been working with Elsevier, AGU and Wiley, and the USGS to incorporate their content. The current library consists of nearly 800,000 documents and is growing in size at a rapid clip. The data in these documents are sometimes called dark data, and to help bring dark data to light, GeoDeepDive pre-processes all documents using a variety of software tools, including natural language parsing (NLP) and document layout-focused optical character recognition tools. Thus, in addition to doing simple full-text string searches (comparable to what one achieves when doing a search on digital books), it is possible to analyze the linguistic usage of and relationships between terms, how they are used in relation to figures and tables, and to write software applications to extract structured data from many thousands of documents simultaneously.

Another class of "dark data" is the legacy data produced by field geologists who have retired or passed on. These data - including that contained within field books, thin section, notes, maps, sketches of interpretations, etc. - are typically lost to future generations, reflecting a waste of both human and financial resources. For truly important datasets from inactive researchers, current dedicated community members must prioritize the value of the legacy data based on potential scientific impact so it can be translated to a usable form. In the future, if we leverage the capabilities of cybertechnology routinely in our data collection (Fig. 1), we can capture field data "born-digital" while conducting fieldwork and making observations in real time. Discussions about field-based data systems have revolved around the concept of integrating data collection into the workflow of the scientist. This approach facilitates the preservation of data for future generations.

There are many important differences between the print literature of the past and the value of open data sharing that is the vision for the future (Table 1). The strengths of digital scholarship are gaining international attention, particularly to promote transparency and open science (Alberts et al. 2015; Nosek et al. 2015). EarthCube's Geoscience Papers of the Future Initiative has trained hundreds of scientists to publish articles following best practices to use unique identifiers and citations to document data, samples, software, and provenance (Gil 2015). Additionally, the Coalition on Publishing Data in the Earth and Space Sciences (COPDESS, www.copdess.org) aims to promote common policies and procedures for the publication and citation of data across Earth Science journals.

The expanding information and literature on digital networks, e-infrastructures and technologies, and the uses of big data is vast and overwhelming. However it is clear that open data sharing has important potential benefits that include economics, societal expectations and resources, input to decision making, and education and research innovations. These opportunities necessitate increased interdisciplinary and interagency collaborations. An open source, open data sharing approach will require intense community involvement to ensure common standards, interoperability, data traceability, quality control, preservation and storage,

Traditional Print Literature	Digital Networked Information
Physical, fixed, static, rigid	Virtual, interactive, dynamic, flexible, scalable, iterative
Geographically local, limited content	Global, unlimited content & multimedia
Referenced, key words	Easily linked with multiple identifiers, samples, methods
Centralized production, linear access	Distributed integrated production, non-linear access & discovery
Restricted formatting & tools	Multiple options, overlays, 3D - 4D visualization formats & tools
Cumbersome copying, retyping	Simple copying, identical replication
Slow knowledge diffusion & dissemination	Accelerated, rapid knowledge diffusion & dissemination

Table 1: Data sharing differences of the past at left with the present/future at right, (modified after Uhlir 2006; Uhlir and CODATA 2015).

and a host of other data principles being considered by national to international entities spanning all the sciences. As an example, adoption of data principles has been extensively considered by the 101-nation Group on Earth Observations (GEO, www.earthobservations.org). Additionally, countries in the Belmont Forum (www.belmontforum.org) are united in their effort to build international knowledge and support human action and adaption to global environmental change, which requires leadership in e-infrastructure. The Belmont Forum has formally adopted a data policy to implement standardized data management. Despite challenges, open data sharing must and will happen globally.

Planning for the future needs to start happening now. In order for geologists to access America's great databases of the past, present, and future, where would these databases reside? The data repositories need to be stable, long term, accessible, and sustainable. In some cases, we may be able to construct customized software applications to allow our data to go into existing databases. Another alternative might be to examine whether professional organizations could embrace a new role in being the ultimate long-term repository for databases. Professional societies are seeing their roles change as more journals and publications go online and open access policies proliferate. Those societies are thus asking how they can stay relevant. Assisting in the formation of long-term repositories is one potential avenue. There are many positive aspects of engaging and partnering with our professional societies, including the depth of their membership, their national to international reach, and their internal partnerships and affiliations that share field geology as well as geoinformation needs. The role would be akin to our ultimate virtual library of not only journal articles, but also networking the raw geologic databases, and rich metadata. We have already seen what kinds of struggles can occur between scientists generating the data, and privately operated, for-profit journals that own the copyright to the data and images that find their way to print. Funding agencies are interested in helping start initiatives, but need the projects to be sustainable as federal agencies cannot generally commit to long-term funding. While this issue is unresolved, it will take visionary leaders to find long-term sustainable solutions for the future.

ON THE WAY TO MAKING PROGRESS

Three current examples of geological approaches that utilize cyber tools illustrate where our community is today, and how data sharing and cybertechnology can work. These examples show potential ways for our sedimentary community to move forward.

1. The System of Earth Sample Registration (SESAR)

SESAR (www.geosamples.org) is a sample registry that distributes and catalogs sample metadata and allows users to register IGSNs (International Geo Sample Number). Governed by an international implementation organization (the IGSN e.V.; www.igsn.org), the IGSN is a persistent and globally unique identifier for sites and specimens. Sample types can range from deep sea to ice cores, to rock, mineral, and fossil specimens, to synthetic specimens, to water samples and more. The use of the IGSNs in publications (Hanson 2016) can connect physical samples and sample collections across the Earth sciences with digital data infrastructures, thus improving the discovery, access, sharing, analysis, and curation of physical samples, as well as the data

associated with them. Additionally, the EarthCube RCN iSamples (Lehnert et al. 2015) gathers together a broad range of stakeholders who use, curate, and access all kinds of samples to define and address the needs and challenges of digital sample management and to develop a set of community-endorsed best practices (e.g., the use of the IGSN) and standards that draw upon existing and emerging efforts both within and outside of EarthCube.

2. Macrostrat: Leveraging Existing Sedimentary Knowledge for a Data-Rich Starting Point

Sedimentary geology does yet not have a centralized data repository, but there nonetheless exists a large amount of useful published data and knowledge (of all types and qualities) on the distribution of sediments and sedimentary processes in space and time. Macrostrat's primary purpose is to integrate this existing information (Fig. 2), including regional geological columns and geologic maps, in order to facilitate the quantitative analyses that are necessary for testing a wide range of hypotheses and for calibrating models of Earth systems (e.g., Peters 2006; Finnegan et al. 2012; Halevy et al. 2012; Peters and Gaines 2012; Peters et al. 2013; Heavens 2015). Macrostrat currently has a chronostratigraphic inventory of > 33,000 surface and subsurface rock units that are also linked to more than 2.5 million geologic map polygons, tens of thousands of fossil collections (paleobiodb.org), paleocurrent measurements (Brand et al. 2015), and nearly 200,000 geochemical measurements from the USGS national geochemistry database. Building on Macrostrat's API, another program named Flyover Country (fc.unm.edu) focuses on geological discovery from a plane window and an iOS app called Mancos provides mobile users mobile access to maps, columns, and fossil collections.

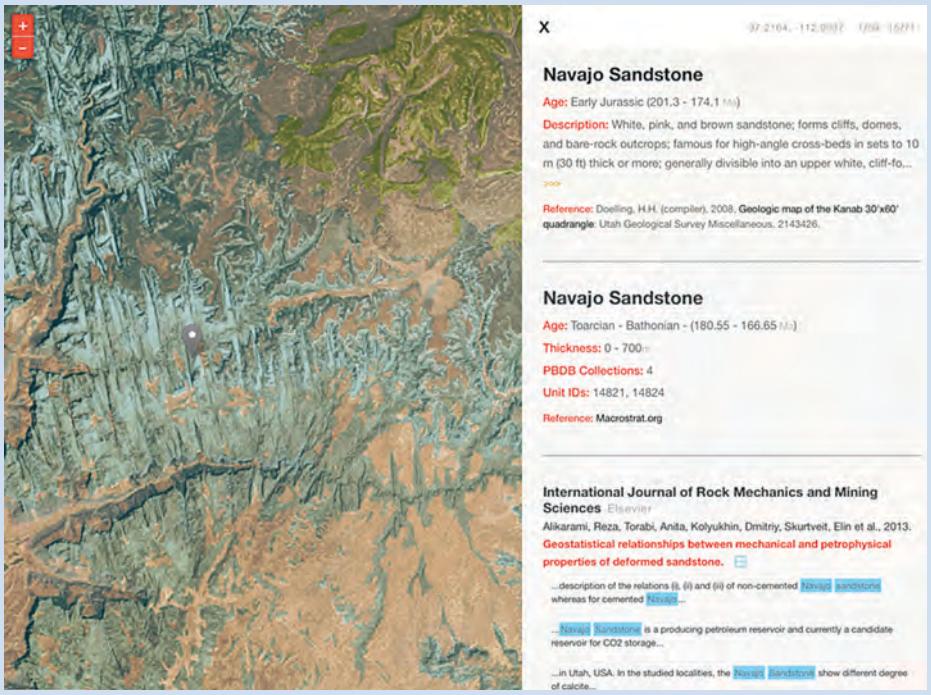

Figure 2: A screen capture of Macrostrat's geologic map interface (draped over an aerial image) shows Jurassic Navajo Sandstone exposures northwest of Kanab, Utah (close by the cover image). The image area is ~ 13 km across. Click-interactions utilize a point-based query system that gives access to: 1) bedrock unit descriptions from original map sources; 2) corresponding Macrostrat units and modeled ages; 3) literature linked to that geologic unit on the basis of rock unit nomenclature and age; and 4) usage snippets of that rock unit name from the full document text (via GeoDeepDive).

In the field, Macrostrat can help by providing broad context and rapid connections to existing knowledge and the literature. A mobile application called Rockd, currently in beta testing, is focused on facilitating the digital archiving of outcrop-based descriptions, photos, and measurements that are readily linked (with intuitive user guidance of geographic location-aware data streams) to existing Macrostrat rock units and other entities in the database (e.g., geologic map polygons, stratigraphic nomenclatural hierarchies). The connection between field data and the broader knowledge base will continue to deepen automatically as the field location data improve and as new data accrue in the literature and in Macrostrat. This digital platform can currently accommodate a variety of scientific and educational uses. However, in the future it will be able to integrate other datasets and thereby accelerate application developments focused on acquiring new or differently structured sedimentary data.

The Macrostrat infrastructure is a good starting point only because it already has a wide range of basic data and a programmatic interface for accessing them, but it currently lacks community involvement in the critical processes of curation of existing content and the generation of new field-based data summaries from other geographic regions. Rockd will be individually managed and has tools to facilitate community involvement, but there is a need for even more substantive participation. In particular, engaging regional sedimentary geologists who have gained deep knowledge through extensive fieldwork is critical to the future of Macrostrat or to any other pursuit that aims to archive sedimentary data.

The potential scientific impact and value of community participation in

enhancing existing information in Macrostrat and expanding its reach geographically is hard to overstate. No matter how sophisticated or complete a database like Macrostrat becomes, it is never perfect and the work is never done. More importantly, the work of regional geologists - generating new age constraints, solving regional structural problems by mapping contact relationships, and refining our understanding of the origin and meaning of the stratigraphic record - must be more completely represented as part of the investigative process itself if any real progress will be made in bringing sedimentary geology to the information age.

3. Strabo for Structural Geology and Tectonics (SG&T)

The structural geology and tectonics community was, until very recently, in the same situation as the field-based sedimentology community - without any existing data repository. The main reason for this deficiency is that field-based structural geology data are complex, including a wide range of temporal and spatial scales (across multiple orders of magnitude), complex three-dimensional geometries, and the necessity of making temporal inferences from spatial observations.

A NSF-funded cyberinfrastructure project focuses on a data system known as Strabo (Walker et al., 2015). A key breakthrough was the development of the "Spot" concept, which allows tracking of hierarchical and spatial relations between structures at all scales, e.g., linking map scale, field mesoscale, and laboratory scale data. A Spot can be a single measurement, a group of measurements, or a relationship shared between numerous other Spots (e.g., cross-cutting relations). The Strabo data system is platform independent from mobile device to desktop, and can accommodate other digital data types (e.g., ArcGIS) to enable collection and sharing of data from field to laboratory applications.

The SG&T community was invited to engage in the development of Strabo. The community provided input through town-hall meetings and workshops to develop community standards. Upcoming field workshops will test Strabo in three pilot areas designed to illustrate the capabilities of the database. In addition, the Strabo data system will be used during the University of Kansas field camp. This is a critical step to see how the next generation of field geologists will use the system and will provide valuable feedback from a group with extensive experience with mobile devices and applications.

The Strabo effort demonstrates how another community rapidly developed the ability to report data digitally. Strabo is developing both the interface as well as the backend database to serve the community. The database further is service oriented, so any person, group, or other effort can seamlessly interact with Strabo to extract or discover data and content. Further, many of the tools necessary for structural geology are applicable to sedimentology, and the Strabo data system may be able to expand to include sedimentological data. There are significant advantages to having different types of field data included in the same data system, as it encourages valuable integration across multiple subdisciplines.

SUMMARY

The field data we acquire is unambiguously scientifically and societally relevant. As individuals and collectively as a community, sedimentary geologists need to be responsible stewards of the rich data we have generated in the past and that we will continue to generate in the future. If we integrate the goals of merging Earth science and cyberinfrastructure, along with the requisite technical skills to utilize ever-growing digital data resources into our pedagogy, this approach will provide training and will help to open the minds of the present generation of students to new lines of inquiry.

Change is happening very quickly. We must start getting our field data into digital repositories because **we cannot afford to have our data overlooked or ignored**. Our professional societies are positioned to provide a foundation and possibly a repository for geologic databases. More importantly, all of our field data have the potential to contribute to many questions, including those that are often much bigger than we originally set out to address. For example, consider how much less we would know about the history of biodiversity, the severity of global mass extinctions, or the biological impacts of global climate change if paleobiologists had never constructed Neotoma or the Paleobiology Database. What outstanding questions are we failing to be address because sedimentary geology lacks such integrative database efforts? There is always inertia to overcome when attempting to modify our scientific workflows, but it can easily become second nature, in the same way we have embraced GPS coordinates over an old survey system of township and range. We need sedimentary leaders to initiate conversations, workshops, and proposals to get our community on the right track to digital integration. While the work ahead can seem daunting and intimidating, potential collaborations and outcomes for the next generation promise to be very rewarding.

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PRESIDENT'S COMMENTS

If you love the movies, like I do, you may know that there has been rather a brouhaha regarding the complete lack of non-white acting nominations for this year's Academy Awards. I have been reviewing SEPM's website, and I would urge all of you to take a look at our list of past recipients of SEPM Awards. I can't speak to the diversity of all aspects of SEPM, but the rather low number of women who have won awards, 18 out of 264, or about 6% struck me as rather low, but is it representative of our demographics? A scan of SEPM membership rosters shows that women comprise about 15-20% of our membership, but they are not receiving 15-20% of our awards. The one exception is our Wilson medal, which bats at 33% women awardees. I do understand that historically geology has been a male-dominated field, so perhaps there is some explanation for the low numbers of awardees, especially in our earlier years, but perhaps we can do better in the future?

As you look through the list of past awardees, take a pause to consider the contributions of the names that you recognize. Then take another pause and see if you can think of inspirational scientists that really should be on those lists. Perhaps you will recall some inspirational papers that you have read or perhaps an engaging lecture that you heard? Once you have gone through that process its time to take the initiative and nominate that person. Yes, it takes a bit of effort to make a nomination, but we have hard-working committees that will take your nomination very seriously and help SEPM honor those who are most deserving. Some years ago, I looked through the list of awardees and felt strongly that my outstanding colleague, Henry Posamentier, who served as mentor to me in my early days in the oil industry, deserved some recognition and initiated the nomination process. I was delighted to attend the 2008 SEPM President's Award ceremony to see him win his well-deserved Pettijohn award.

I am very delighted that our incoming President-Elect Wilson Medalist, Maria Mutti, will be arriving with Jean Hsieh as our new Secretary-Treasurer, Liz Hajek as our new Research Councilor, Kristin Bergmann as our new Early Career councilor, John Riejmer as our new International Councilor, Jeremy Krimmel as our new Web-Councilor, and Gary Hampson as *JSR* co-editor. SEPM has done a great job of balancing and diversifying our new council and I have high hopes that we will continue to both be inclusive and hold all of us to the very highest standards of scientific excellence.

Please also join us in Calgary this June at our SEPM Business Luncheon, which will feature one of my former professors, Twenhofel Medalist and SEPM Honorary Member Noel P. James as our dynamic guest speaker, as well as the Tuesday evening President's award ceremony where we will honor the 2016 awardees. Despite the present downturn, I am very hopeful that we will nevertheless have a great annual meeting with lots of exciting science. I hope to see you in Calgary this summer.

Janok Bhattacharya,
SEPM President

SEPM Society for Sedimentary Geology
"Bringing the Sedimentary Geology Community Together"
www.sepm.org

SEPM STUDENT PARTICIPATION TRAVEL GRANT PROGRAM

SEPM has established a new student presentation/travel grant program entitled SEPM Student Participation Grants. These grants provide travel funds for students that have abstracts accepted to SEPM 'approved' meetings and conferences. Check out the rules for this program at http://www.sepm.org/Apply-for-a-Student-Travel--Grant

THE GEOLOGICAL SOCIETY OF AMERICA®

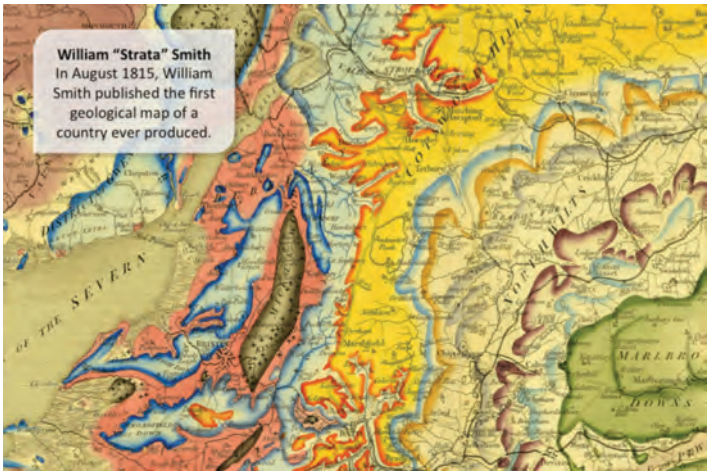
SEDIMENTARY GEOLOGY DIVISION

Join Us for the Annual 2016 GSA Meeting in Denver, CO

Sedimentary salutations for 2016! In this issue we want to highlight some of the 2015 accomplishments of GSA's Sedimentary Geology Division (SGD) and to give you a head's up on what to look forward to in 2016. Our membership remains at an elevated level at ~1693, though down a bit from 2014. We want to continue to grow, especially by adding new student members and to serve the membership better! So please pass along your suggestions for improvement directly to the division officers or better yet get involved!

2015 GSA Annual Meeting in Baltimore, Maryland Recap

The SGD had an excellent turnout at our many sponsored events at the 2015 Annual GSA Meeting in Baltimore, Maryland. We sponsored a Pardee Session "Celebrating the Genius of William 'Strata' Smith: Bicentennial Anniversary of Smith's Revolutionary map. To honor this great event we passed out free copies of a special SGD bicentennial postcard of Smith's map.



Bicentennial Anniversary Smith Map Postcard

The SGD sponsored 12 topical sessions, 1 short course, and 3 field trips. We had a wonderful turnout of over 36 posters in the SEPM/SGD sponsored student poster session.

First Annual Combined Seds and Suds and Awards & Business Meeting

We tried a new combined format to our division meetings this year in Baltimore where we combined the Seds & Suds social networking meeting with the Awards & Business Meeting, which is already combined with the Limnogeology Division Awards & Business Meeting. The "Super PACed" event was held on Tuesday night so as not to conflict with the Alumni parties held on Monday night. It was well attended and had a very packed agenda! Our rational for combining all the events was in part financial and in part trying to meet the time constraints of our very busy SGD membership, which has had difficulty in the past attending more than one SGD function. *Let us know what you think of the new format!*

We started the evening event with food, drink, and conversations while we introduced a new discussion starter this year, the BYE (Bring Your own Example). Members brought to the meeting a print out of an interesting or perplexing sedimentary feature and members provided feedback and discussion in a casual setting over a beer.

BYE from Margie Chan. Odd silica cementation patterns in Neogene Tesuque Fm., near Santa Fe, NM

We're looking to develop and formalize the BYE further at the 2016 GSA Annual Meeting in Denver and are looking for feedback. How might we encourage discussion between members and BYE presenters? How do we get students to actively participate? Should we give out prizes to students? What's a better name? Please pass along your suggestions to the SGD committee (contact information below) and help us make this a really fun new event.

The SGD Awards ceremony followed where we honored **Joanne (Jody) Bourgeois**, of the University of Washington as the 16th recipient of the Laurence L. Sloss Award in recognition of her pioneering work on storm and tsunami deposits, her dedicated educational and scientific leadership, and her generous service to GSA and the profession. Dr. Bourgeois advanced the study of storm deposits through analysis of Cretaceous to Neogene shoreface and continental-shelf facies. Through her own and her students' research, as well as by organization of seminal workshops, Bourgeois has nurtured the worldwide growth of tsunami sedimentology and its applications.

Jody Bourgeois (center), 2015 Lawrence L. Sloss Award winner with citationist Lonnie Leithold (right) and SGD Chair Margie Chan (right).

John Chesley was selected as our 2015 Student Research Award Recipient. He is a M.S. student at the University of South Carolina at Columbia. His project is entitled *"Modeling fluvial planform architecture from the Salt Wash Member of the Morrison Formation, central Utah: New applications for understanding ancient fluvial systems".*

John Chesley (left) was this year's winner of the SGD Student Research Grant pictured with SGD Chair Margie Chan (right).

SEPM-SGD Outstanding Student Poster winners

This year's 2015 SEPM/SGD "Sedimentary Environment and Process Studies of the Emerging Generations of Scientists" student poster winners were:

Ames, Carsyn; Leier, Andrew; Leckie, Dale A.; Heinze, Cody; Chesley, John; Rubino, Erica; and Barbaeu Jr., David L.: *"Detrital zircon provenance of Paleogene-Neogene fluvial conglomerates and the Cenozoic evolution in the Northern Rockies and Southern Canadian Plains".*

Jones, Evan; Wang, Jianqiao; and Plink-Bjorklund, Piret: *"Scaling the California paleoriver: a source to sink approach applied to flashy fluvial deposits in the Early Eocene Wasatch and Green River Formations, Uinta Basin, UT".*

Chilton, Kristin D.; Romans, Brian W.; and Flynn, Shauna: *"North Atlantic Ocean circulation response to climate change at Eocene-Oligocene transition, IODP Site U1411, Newfoundland Ridge Drift Complex".*

Conwell, Christopher T.; Cerkez, Elizabeth B.; and Buynevich, Ilya V.: *"Origin of anomalous magnetic susceptibility and coloration in relict Atlantic oyster shells: Geochemical insights".*

Austin Boles of the University of Michigan-Ann Arbor was selected for the 2015 Stephen E. Laubach Structural Diagenesis Research Award given by Structural Geology & Tectonics (SGT) division this year. His research project is *"Diagenetic illite growth records the composition and timing of orogenic fluid expulsion in the Northern Appalachian Basin".*

Nicholas Williams of Northern Illinois University was a Honorable Mention for this prestigious award.

In Memoriam

The evening ended with a tribute to NSF Program Manager H. Richard Lane, as well as important leaders and friends in the sedimentary geology community that we lost in 2015 including: John Adams, Charles Almy, John Baldwin, Henry Berryhill, Jon Boothroyd, Richard Bowen, Stephen Bowles, Bill Cobban, Aureal Cross, John Crowell, John Dennison, William Dickinson, Theodore Ehring, A. Frische, Donn Gorsline, Jonathan Harrington, Michael Higgins, Blair Jones, Richard Kennedy, Chuck Kluth, Wann Langston Jr., Morris Leighton, Wallace McCord, George Moore, Robert Neuman, Arthur Pyron, Mark Rich, Ernest Russell, Herbert Skolnick, Robert Smalley, William Spackman, Frank Sonnenberg, Chris Suczek, Robert Terriere, Thomas Thompson, James Vine, Timothy Wawrzyniec.

Some of the Grand Dames of the sed world at the GSA Penrose Circle reception. Top left: Heather Macdonald, Elizabeth Gierlowski-Kordesch, Mary Kraus. Bottom left: Judy Parrish, Jody Bourgeois, Margie Chan, and Charlotte Schreiber.

What's New for 2016

Plan on joining us for the 127th GSA Annual Meeting in mile high Denver, Colorado in September 2016. SGD has sponsored many sessions this year, so be sure to get your abstracts in by July 12, 2016.

2016 SGD Officers

Chair – Kate Giles (kagiles@utep.edu)

Vice Chair – Gary Gianniny (gianniny_g@fortlewis.edu)

Secretary Treasurer – Linda Kah

Student Representative – Kelsi Ustipak

Webmaster – Kelly Dilliard

We installed new SGD Chair and Vice Chairs this year. Kate Giles of The University of Texas at El Paso took over the reigns as Chair (2016-2018) from Margie Chan and Gary Gianniny of Fort Lewis College was elected Vice Chair (2016-2018).

Kate Giles (SGD Chair 2016-2018) and Gary Gianniny (SGD Vice Chair 2016-2018)

Get Involved with the Sedimentary Community!

We could use your help and ideas in making SGD a dynamic and vibrant research community. Consider proposing a Penrose Conference or a Thompson field Forum (www.geosociety.org/penrose or www.geosociety.org/fieldforums/), nominating leaders in our community for the Sloss Award (rock.geosociety.org/sed/SGD_Awards2.html#Sloss) or serve on a SGD committee. We will also be looking for a new SGD student representative this fall, so contact Kate or Gary if you're interested!

A special "Thank you" to all those who served on our 2015 SGD committees.

CALGARY ACE, JUNE, 2016

If you are going to attend the AAPG/CSPG/SEPM ACE Meeting in Calgary this June, please mark the SEPM membership box when you register. This is a source of income to SEPM from AAPG for the meeting and its helps SEPM's bottom line. SEPM has a suite of short courses and field trips and the usual SEPM events – Research Groups, Luncheon, and President's Reception and Awards Ceremony. Join us! http://ace.aapg.org/2016

SEPM INCOMING COUNCILORS

These volunteer members will take official office at the SEPM Annual Meeting in Calgary, Alberta, Canada – June, 2016.

President-Elect: **Maria Mutti**

Maria is Professor of Sedimentary Geology at the University of Potsdam (Germany), where she teaches sedimentology, advanced stratigraphy and petroleum geology. She received a M.S. degree from the University of Bologna (1987), a M.S. from the University of Wisconsin-Madison (1990) and a Ph.D. from the University of Milan (1992). Maria held research positions at ETH in Zürich and Woods Hole Oceanograhic Institution and faculty positions at the University of Southern California and the University of Stuttgart. She is also member of IAS, where she served as Vice-President, and of AAPG, AGU, GSA, and other European geoscientific organizations. In 2002 she received the SEPM Wilson Award for an early career geologist.

Secretary-Treasurer: **Jean Hsieh**

Jean received her B.Sc. (Honours) in geology from Carleton University in Ottawa, Canada in 1987 and her PhD from the California Institute of Technology (Caltech) in 1991 studying the stable isotopic composition of soil water and pedogenic minerals (carbonate and clays). In 1999, Jean joined Texaco in Houston which became part of Chevron in 2001. Upon joining the carbonate stratigraphy team in 2004, she moved to San Ramon, California. In 2011, she relocated to Calgary, Canada working as a carbonate sedimentologist for Talisman Energy which was acquired by Repsol in 2015. She is a member of IAS, AAPG, CSPG, GSA, AGU and AWG.

Web & Technology Councilor: **Jeremy Krimmel**

Jeremy received his BS in geology and teaching certification from the University of Texas at Austin in 2007. He taught high school math, biology, and chemistry at a private school in the Austin area until 2008. Jeremy then attended the University of Houston for his MSc in geology with a thesis in carbonate sedimentology. During graduate school, he completed an internship at Maersk Oil studying carbonates as a member of the Brazil exploration team. Following his internship, Jeremy worked as an exploration geologist for Maersk Oil in Houston and an operations geologist in Copenhagen (Denmark) until 2014. He is now employed at W&T Offshore in Houston as an exploration geoscientist. Jeremy is dedicated to finding innovative ways to use technology to improve geologic workflows.

Research Councilor: **Elizabeth Hajek**

Liz is a clastic stratigrapher with extensive experience in fluvial sedimentology. Her research is aimed at improving process-based reconstructions of sedimentary environments and she utilizes fieldwork, outcrop imaging, numerical modeling, and physical experiments to answer questions about how terrestrial and marine dynamics are recorded in stratigraphy. She graduated with honors from Macalester College (St. Paul, MN) with degrees in Geography and Geology (2002) and received her MS and PhD in Geology from the University of Wyoming (2009). In 2009-2010 she was a post doctoral researcher at the St. Anthony Falls Laboratory, University of Minnesota and started as an Assistant Professor of Geosciences at the Pennsylvania State University in 2010. She currently holds the Rudy Slingerland Early Career Professorship in the College of Earth and Mineral Sciences and teaches a range of courses including a large general-education oceanography class and several graduate courses in stratigraphy.

International Councilor: **John J.G. Reijmer**

John received his BSc and MSc education at the University of Amsterdam and moved to the VU University Amsterdam for his PhD studies that concentrated on the skeletal/non-skeletal compositional analysis of recent (Bahamas) and Triassic calciturbidites (Austria and Italy). Later at GEOMAR his research focused on present-day carbonate systems in the Caribbean, Gulf of Aqaba, Southern Indian Ocean and Gulf of Panamá to Carboniferous (Spain) – and Jurassic (Morocco) carbonate platform systems. In 2005 he accepted a Full Professorship in Carbonate Sedimentology at the Université de Provence. In 2007 became a Full Professorship in Carbonate Sedimentology and Marine Geology in his hometown Amsterdam, where he has been with the VU University Amsterdam since that date and also occupied a part-time professorship at Delft University of Technology for six years. In 2014 he visited the TOTAL Research Laboratory in Pau (France) for an 8-month sabbatical. He is a member of AAPG, GSA, IAS, DGGV (German Geological Society), KNGMG (Dutch Geological Society and SEPM).

Early Career Councilor: **Kristin Bergmann**

Bergmann received a BA in geology from Carleton College in 2004. She completed her MSc and PhD at the California Institute of Technology under the direction of Professors John Grotzinger, Woodward Fischer, and John Eiler. After graduating she was a Junior Fellow with the Harvard Society of Fellows, working with Professor Andrew Knoll. She is currently an Assistant Professor at the Massachusetts Institute of Technology. Kristin Bergmann's multi-disciplinary research – sedimentology and stratigraphy, stable isotope geochemistry of carbonates including clumped isotope thermometry, and geobiology - focuses on reconstructing the record of environmental change from observations of sedimentary rocks spanning Precambrian to end-Ordovician time. To date her work has focused on marine carbonate sedimentary rocks and fossils from sites that include locations in the United States, Oman, and Svalbard. She is a member of AAPG, AGU and the Geological Society of America.

Co-Editor JSR: **Gary Hampson**

Reader in Sedimentary Geology in the Department of Earth Science and Engineering at Imperial College London. He has been a member of SEPM since 1991, and has previously served the Society as convenor or technical committee member for two Research Conferences. Gary has been an Associate Editor of the *Journal of Sedimentary Research* since 2011, and held similar positions for *Sedimentology* (2013-2015), Basin Research (2010-2015) and *Journal of the Geological Society of London* (2005-2013). Gary is a member of IAS, the British Sedimentological Research Group, AAPG, the Geological Society of London, and the Petroleum Exploration Society of Great Britain.

UPCOMING SEPM RESEARCH CONFERENCES

2016

SEPM-AAPG Mudstone Diagenesis Research Conference
Conference webpage: http://www.sepm.org/MudstoneConference
Dates: 16-19 October, 2016
Venue: Sante Fe, New Mexico
This conference will promote the exchange of new ideas among the leading experts from industry, academia, and government on the controls and impacts of inorganic and organic diagenesis on mudstone hydrocarbon generation, reservoir properties and seal quality.
Conveners: Wayne Camp (Andarko), Neil Fishman (Hess), Paul Hackley (USGS), Kitty Milliken (BEG—UT Austin) & Kevin Taylor (Manchester Metro. Univ.)
- Abstracts are closed and the program is being organized.
- Registration opens June, 2016

Oceanic Anoxic Events
Conference webpage:www.sepm.org/OAE-Conference
Dates: 2-7 November, 2016
Venue: Austin, Texas, USA
Oceanic anoxic events (OAE) are described as relatively short geological time intervals (< 1 Myr) where large parts of the world oceans became depleted in oxygen. Contemporaneous mass marine extinctions, perturbation to the global carbon cycle, and widespread black shale deposition are thought to be related to these events.
Conveners: Rob Forkner (Statoil) <RFork@statoil.com >, Charles Kerans (UT Austin), Benjamin Gill (Virginia Tech), Gianluca Frijia (Univ. Potsdam) & Ute Mann (Statoil)
- Abstract Submission deadline March 31st.

Mesozoic of the Gulf Rim and Beyond: New Progress in Science and Exploration of the Gulf of Mexico Basin
Conference webpage: http://www.sepm.org/2016PerkinsRosen
Dates: 4-6 December, 2016
Venue: Houston, Texas, USA
The 35th GCSSEPM 2016 Perkins-Rosen Research Conference will focus upon the Mesozoic of the Gulf Basin, from mountain source terrain to deep-water abyssal plain. A significant portion of the program will be devoted to the Mesozoic of Mexico and its potential for international exploration. A highlight will be a special SEPM-sponsored research symposium on Mesozoic source to sink: provenance and process led by Mike Blum (U. Kansas). Technical
Conveners: John W. Snedden, UT-Austin; Mike Blum, U. Kansas: Chris Lowery, UT-Austin
- Abstract Submission – Closed
- Program being organized

2017

Mountjoy II – Joint SEPM/CSPG Research Conference: Characterization and Modeling of Carbonate Pore Systems
Conference webpage: tba
Dates: 26-29 June, 2017
Venue: Austin, Texas, USA
The 2017 Mountjoy Conference, sponsored by SEPM and CSPG, will be held at the University of Texas Learning Commons and the Texas Bureau of Economic Geology core facilities. The Conference will showcase new approaches and results through oral and poster sessions as well as core workshops and selected fieldtrips. The theme is broad, encompassing the stratigraphic, facies and diagenetic influences on varied pore systems, petrographic, geochemical and visualization tools applied to enhanced characterization of pore systems, from nano- and micro-scale, to fractures and cavernous pores, and new approaches for modeling the origin and distribution of pore systems. Integrated case studies from academia and industry are of particular interest. One of the highlights of the 1st Mountjoy meeting in 2015 was the opportunity for individual discussion and interaction between the attendees and the presenters. The 2017 Mountjoy Conference will continue to stress the importance of dedicated time for discussion and one-on-one networking throughout the program.
Main Conveners: Mitch Harris; Gene Rankey; Don McNeill; Astrid Arts; and Jean Hsieh
- General structure being organized

35 Years of Research on the Monterey Formation and Neogene Upwelling Deposits: Celebrating Bob Garrison's Life and Career
Conference webpage: tba
Dates: TBD, 2017
Venue: Monterey area, California, USA
An SEPM-SEPM Pacific Section research conference designed to review and discuss the 35 years of work since the keystone SEPM Pacific Section Special Volume "The Monterey Formation and related siliceous rocks of California, Volume 15, Society of Economic Paleontologists and Mineralogists, Pacific Section, Special Publication." Robert Garrison was one of the editors and main authors. The volume was transformative. This work turned out to be the fundamental building block of modern 'paleoceanographic', with an in depth approach to understanding the Monterey Formation and similar biosiliceous deposits, insights into the Miocene climate, and the significance of biosiliceous upwelling sediments and phosphorites around the globe and their economic importance.
Main Conveners: Invano Aiello (MLML) and Christina Ravelo (UCSC)
- General structure and dates being determined

If you are considering a research conference within the realm of sedimentary geology be sure to consider working or partnering with SEPM Society for Sedimentary Geology.

1926 SEPM Society for Sedimentary Geology